Three saprobic Dothideomycetes from the aerial parts of mangrove trees with polyphenism in *Striatiguttula*

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Research Article

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Abstract

Fungi inhabiting the aerial parts of two mangrove trees, *Nypa fruticans*, and *Rhizophora apiculata*, were studied from the central region of Thailand, utilizing morpho-molecular characteristics. Three different fungal taxa were isolated including *Rhytidhysteron kirshnacephalus* sp. nov., *Lasiodiplodia citricola* and *Striatiguttula phoenicis*. Sexual morphs are reported for these three taxa and the asexual morph of *Striatiguttula phoenicis* is identified based on molecular data. This is the first asexual morph report for the genus *Striatiguttula* as well as the family Striatiguttulaceae. The new isolate of *Striatiguttula phoenicis* differs slightly from other extant species in the genus in terms of measurements of ascomata, asci, ascospores, and thickness of peridium. Also, a pigmented hamathecium was observed in this species. The morphological results are congruent to the phylogenetic results of previous studies and support *Striatiguttula phoenicis* as a new host record from *Nypa fruticans*. *Rhytidhysteron kirshnacephalus* was collected from dead twigs of a standing *Rhizophora apiculata* in Cha-am and it has significant morphological and molecular differences to support its establishment as a novel taxon. Phylogenetically, *Rhytidhysteron kirshnacephalus* forms a sister clade to *Rh. magnoliae*, but has different ascomatal characters, including, smooth margins without striations and black pruina. *Lasiodiplodia citricola* is another species from Cha-am and a new record from Thai mangroves. Detailed descriptions of the isolates, along with their potential ecological roles, are provided. We have also provided the occurrence of fungi from the aerial parts of mangrove trees worldwide.

Introduction

Mangroves are salt-tolerant forest ecosystems consisting of woody trees, shrubs, and palms that grow in the intertidal zones of sheltered shores, estuaries, tidal creeks, backwaters, lagoons, marshes, and mudflats of tropical and subtropical coastal regions (Chaeprasert et al. 2010, Thatoi et al. 2013, Hamzah et al. 2018, Kumar et al. 2019a,b). Mangroves are hosts to many fungi, known as manglicolous fungi (Sarma and Hyde 2001, Sarma and Vittal 2001, Vittal and Sarma 2006, Sakayaroj et al. 2011). Mangroves are mainly evergreen forests, productive and rich in nutrients providing organic matter for fungal colonization (Hyde and Lee 1995, Besitulo et al. 2010) as indicated by the variety of species encountered in numerous studies (Hyde 1988a,b, 1990a,b, Sarma and Hyde 2001, 2018, Maria and Sridhar 2003, Sakayaroj et al. 2010, Jones and Abdel-Wahab 2005, Raveendran and Manimohan 2007, Alias and Jones 2009, Isaka et al. 2009, Nambiar and Raveendran 2009, Suetrong et al. 2010, Dayarathne et al. 2017, 2018, Devadatha et al. 2018a,b,c,d, Jones et al. 2019). Previous studies have concentrated on fungi isolated from the intertidal region of the mangrove forests and focused primarily on dead stems, leaves, or bark. However, fungi inhabiting the aerial parts of mangrove trees, such as leaves, branches, stems and aerial roots have rarely been considered in biodiversity studies or surveys (Hyde and Cannon 1992, Dayarathne et al. 2017, 2018, Devadatha et al. 2018a,b,c,d, Sarma 2018, Kumar et al. 2019b). These aerial parts form a separate niche for fungi in mangroves that are different from marine fungi occurring in the submerged parts. Studies have shown that aerial parts harbor diverse fungi and they are considered as terrestrial fungi. For instance, Chi et al. (2019) isolated 203 endophytic fungi from leaves of mangrove forests of Taiwan. In another study, Kumar et al. (2018, 2019a,b) isolated fungal taxa from the aerial parts of the mangrove trees *Nypa fruticans* and *Rhizophora apiculata*, which included the asexual morphs of *Akanthomyces muscarius* and *Neopestalotiopsis alpapicalis* and the sexual morph of *Rhytidhysteron mangrovei.*

In Thailand, mangrove forests populate the southern and central coastal regions, where trees from Arecaceae (*Nypa fruticans*) and Rhizophoraceae, are the most abundant (Bamroongrugsa et al. 2013, Kumar et al. 2018, 2019b, Zhang et al. 2019). *Nypa fruticans* is an ancient palm that grows in the upper zone of mangroves stretching from the brackish water zone at river mouths to almost inland freshwater (Rozainah and Aslezaeim 2010, Kumar et al. 2018). In a biodiversity study of fungi on *N. fruticans*, Loilong et al. (2012) reported 139 taxa from Southeast Asian countries, including Brunei, Malaysia, Philippines, Papua New Guinea, and Thailand. Most of the data included fungi reported from decomposing substrates in the intertidal zones. Recently, Sarma and Hyde (2018) listed 46 fungal species from decomposing frond and leaf samples of *N. fruticans* from Brunei, comprising 33 ascomycetes and 13 anamorphic taxa. In another study, fungi found from terrestrial habitats have also been recorded from the aerial and intertidal parts of *N. fruticans*, such as *Fasciatispora petrakii, Astrosphaeriella nipicola, Oxydothis nypicola* (Hyde and Alias 1999, 2000, Poonyth et al. 2000, Kumar et al. 2018). *Rhizophora* sp., another mangrove host genus growing in the same zone as *N. fruticans*, harbored a huge number of marine fungi including both saprobes and endophytes (Kohlmeyer 1979, Sarma and Vittal 2001, Schmit and Shearer 2003, Pang et al. 2010, Sakayaroj et al. 2011, Manimohan et al. 2011, Hamzah et al. 2018, Kumar et al. 2019a,b). Regardless of these studies, still, the species diversity and proper classification of fungi from *N. fruticans* and other mangrove trees are yet to be fully explored. This is more so from the aerial parts of these two mangroves.

Most fungi reported from mangrove hosts belong to Ascomycota (Dayarathne et al. 2020). Among them, studies on marine Dothideomycetes have increased exponentially in recent years (Suetrong et al. 2009, Pang et al. 2013, Loganathachetti et al. 2017, Devadatha et al., 2018a,b,c,2019, Kumar et al. 2019b, Zhang et al. 2019, Jones et al. 2019). These have shown that marine Dothideomycetes occur on a wide range of substrata, including mangrove wood, twigs, and leaves, sea and marsh grasses (Kohlmeyer et al. 1995, 1996, 1997, Suetrong et al. 2009, Kumar et al. 2019b, Zhang et al. 2019). Liu et al. (2017) listed 28 Dothideomycete clades, of which 18 have marine representatives (Jones et al. 2019). New mangrove sites studied in recent times show several new genera and species belonging to Dothideomycetes being recorded and it indicates that there is still a huge hidden diversity to be explored (Devadatha et al., 2017, 2018a,b,c,d, Jones et al., 2019, 2020).

During surveys of fungal species associated with the aerial parts of mangrove plants, *Nypa fruticans*, and *Rhizophora apiculata*, conducted in central and southern Thailand, three fungal species were recorded representing different orders of Dothideomycetes *viz.* Pleosporales, Hysteriales, and Botryosphaeriales. We introduce one new species *Rhytidhysteron kirshnacephalus* sp. nov., by comparing its morphology with existing *Rhytidhysteron* species and providing phylogenetic studies using LSU, ITS, and TEF markers. Two new host records for *Lasiodiplodia citricola* and *Striatiguttula phoenicis* are also introduced. An updated list of fungi occurring in the aerial parts of mangrove trees is lacking. Hence, we have provided a list of fungal diversity from the aerial parts of mangrove trees worldwide.

Materials And Methods

Collection and Isolation

Dead twigs of standing *Rhizophoraapiculata* tree were collected from Cha-am District, Phetchaburi Province in Southern Thailand (12°48'54.8"N 99°58'54.3"E). Dead rachides or leaflets of *Nypa fruticans* were collected from Samut Songkhram Province in Central Thailand (13°21'46.9"N 99°59'43.1"E). Fungi were isolated on potato dextrose agar (PDA) using single spore isolation method as described by Chomnunti et al. (2014). Germinating spores were transferred aseptically to fresh PDA plates and incubated at 27 °C ± 2 °C for 7–14 days to establish pure cultures. Morphological characteristics, such as mycelium color, shape, texture, and growth rate were recorded. Cultures were deposited in Mae Fah Luang University Culture Collection (MFLUCC). Specimens (dry wood material with the fungal material) were deposited in the herbarium of Mae Fah Luang University (MFLU). Specimens were observed and examined with a Motic SMZ 168 stereomicroscope. Micro-morphological characters of the taxon were examined with Canon EOS 750D and Leica. ImageJ software was used for measurements (Schneider et al. 2012). Faces of fungi numbers are provided as outlined in Jayasiri et al. (2015), and the species has been registered for Index Fungorum numbers (2020).

DNA isolation and amplification

Total genomic DNA was extracted, following the modified CTAB method, from freshly harvested mycelium (500 mg) (Thambugala et al. 2015, 2016, Zhang et al. 2019). and Zhang et al. (2019). The ITS region was amplified and sequenced with the primers ITS5 and ITS4 (White et al. 1990), the LSU was amplified using primers LROR and LR5 (Vilgalys and Hester 1990, Rehner and Samuels 1994), NS1 and NS4 were used for SSU (White et al. 1990) and the TEF gene region was amplified using primers EF1-983F and EF1-2218R (Rehner and Buckley 2005). The PCR reactions were performed in a total volume of 25 µl. PCR mixtures contained 0.3 µl of TaKaRa Ex-Taq DNA polymerase, 12.5 µl of 2 × PCR buffer with 2.5 µl of dNTPs, 1 µl of each primer, 9.2 µl of double-distilled water, and 100–150 ng/ µl of DNA template. PCR reactions were run on a BIORAD 1000 Thermal Cycler (Applied Biosystems, Foster City, CA, U.S.A.) using the conditions described by Thambugala et al. (2015) and Zhang et al. (2019). The sequencing of the positive amplicons with primers used in the amplification reaction was carried out by Sun-biotech Company Sequencer (Beijing, China).

Phylogenetic analysis

Consensus sequences were obtained by combining forward and reverse directions, using CLC Main Workbench sequence analysis software v.6.0.2 (CLC bio, Cambridge, MA). Newly generated sequences were analyzed along with reference sequences from GenBank and those derived from Zhang et al. (2019), Thambugala et al. (2016), and Jayawardena et al. (2019) (Table 1, 2, 5). Sequence alignments were prepared with MAFFT v.6.864b (Katoh and Standley 2013: http://mafft.cbrc.jp/alignment/server/) and manually aligned, wherever necessary using BioEdit v.7.2.3 (Hall 1999). The sequence datasets were combined using BioEdit v.7.2.3 and CLC Main Workbench version 6.0.2. The evolutionary models for both Bayesian inference and maximum likelihood analyses were selected independently for each locus using MrModeltest v. 2.3 (Nylander 2004) under the Akaike Information Criterion (AIC) implemented in PAUP v. 4.0b10. The GTRGAMMA model of nucleotide evolution was the best-fit model for all loci. All phylogenetic analyses were performed in the CIPRES Science Gateway v.3.3 (http://www.phylo.org/ portal2/, Miller et al. 2010). Maximum likelihood (ML) trees were inferred using RAxML v.8.2.8 as part of the "RAxML- HPC2 on XSEDE" tool (Stamatakis 2006, 2008). The maximum likelihood bootstrap support was calculated from 1000 bootstrap replicates (Fig.3, 5, 7). Bayesian inference (BI) analysis was conducted using the Markov Chain Monte Carlo (MCMC) algorithm as implemented in MrBayes v. 3.2.2 (Ronquist et al. 2011). Ten (for *Striatiguttula*) and five (for *Rhytidhysteron*; *Lasiodiplodia*) million generations were run with a sampling frequency every 1000th generation. Twenty-five percent of the trees were discarded as "burn-in". Convergence was declared when the standard deviation of split frequencies reached 0.01. Phylogenetic trees were visualized using Fig Tree v1.4.0 (http://tree.bio. ed.ac.uk/software/fgtree/, Rambaut 2012). All newly generated sequences were deposited in GenBank (Table 1, 2, 5).

Results

Phylogenetic analysis

Phylogenetic analyses were performed using combined datasets as follows: in the case of *Striatiguttula*, after alignment the combined LSU, SSU, and TEF gene dataset consisted 110 taxa including *Arthonia dispersa* (UPSC2583), *Dendrographa decolorans* (Ertz 5003) (BR), *Lecanactis abietina* (Ertz 5068) (BR), and *Roccella fuciformis* (Tehler 8171) as outgroup taxa (Zhang et al. 2019). Following trimming, the combined alignment length was 2764 bps, whereby LSU contained 852 sites, SSU had 1011 sites and TEF had 901 sites. The likelihood value of the best-scoring ML tree (Fig. 3) was -28841.595208. The matrix had 1275 distinct alignment patterns, with 30.95% being undetermined characters or gaps. Outgroup sequences formed a monophyletic clade that had maximum support (BS100%/1.0BI). All Striatiguttulaceae sequences grouped together (BS80%/0.97BI). Two sequences from the new isolate SS16-2 grouped with *S. phoenicis* (MFLUCC 18-0266; Fig. 3) with maximum support (BS100%/1.0BI).

A combined LSU, ITS, and TEF dataset was used for the phylogenetic analysis of *Rhytidhysteron* strains. The dataset contained 28 taxa of *Rhytidhysteron* with *Gloniopsis praelonga* (CBS 112415) being the outgroup taxon. After trimming, the alignment had 2420 characters, whereby LSU contained 788 sites, ITS had 640 sites and TEF had 992 sites. The alignment has 522 distinct alignment patterns with 35.16% undetermined characters. The RAxML analysis for the combined dataset provided the best scoring tree (Fig. 5) with a final ML optimization likelihood value of -7391.602161. The new isolate, *Rhytidhysteron kirshnacephalus* resides in a distinct clade as a sister group to *Rh. mangrovei* (BS100%/1.0BI).

The third phylogenetic analysis contained 43 sequences of *Lasiodiplodia* including the new host record of *Lasiodiplodia citricola* (MFLUCC 19-0622) and two outgroup taxa *viz. Barriopsis iraniana* (IRAN1448C) and *B. tectonae* (CMW40687) (Table 5). After trimming, the alignment had 772 characters, whereby ITS had 456 sites and TEF had 316 sites. *Lasiodiplodia citricola* (MFLUCC 19-0622) clustered together with the ex-type strain of *L. citricola* (IRAN 1522C) in the ML analysis and tree topology in BI was most similar to the type strain (Fig. 7). The likelihood value of the best-scoring ML tree was -3733.342956 (Fig. 7). The matrix had 253 distinct alignment patterns, with 4.41% being undetermined characters or gaps. The new isolate, *L. citricola* MFLUCC (19-0622) clustered with *L. citricola* (IRAN 1522C) with low support (BS59%/0.63BI).

Taxonomy

Striatiguttula

The genus was introduced by Zhang et al. (2019) along with another new genus *Longicorpus* in Striatiguttulaceae. *Striatiguttula* is typified by *S. nypae* which was isolated as a saprobic fungus from *Nypa fruticans.* The genus comprises two species*. S. nypae* and *S. phoenicis* (Index Fungorum 2019, Zhang et al. 2019).

Striatiguttula phoenicis S.N. Zhang, K.D. Hyde, and J.K. Liu 2019 (Fig. 1,2)

Index Fungorum number: 828275; *Facesoffungi number*: FoF 05035

Saprobic on the midrib of *Nypa fruticans* Wurmb. leaflet. Sexual morph: *Ascomata* in vertical section 250–380 μm high, 195–310 μm diam ($\bar{x}$ = 360 × 306 μm, n = 10), black, scattered, immersed and erumpent through host epidermis by a papilla or a short neck, ampulliform, subglobose, uni-loculate, coriaceous to carbonaceous, ostiolate, periphysate, papillate, glabrous neck. *Peridium* 30–90 ($\bar{x}$ = 66, n = 10) μm thick, composed of several pale brown to hyaline cells of *textura angularis*, compressed and pallid inwardly. Wall of the neck composed of thick and elongated angular pale brown to brown cells with hyaline inner layers. *Hamathecium* of 1.75–2.5 ($\bar{x}$ = 1.92 μm, n = 20) μm wide, septate, branched, filamentous, anastomosing, trabeculate pseudoparaphyses, embedded in a gelatinous matrix, pigmented (purple). *Asci* 64–128 × 9–13.8 μm, ($\bar{x}$ = 90.4 × 11.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindric clavate, pedicellate, apically rounded, with an ocular chamber. *Ascospores* 13–39 × 6.4–8 μm, ($\bar{x}$ = 27 × 7.2 μm, n = 30), thick-walled, hyaline to light-brown, uniseriate to biseriate, fusiform to ellipsoidal, 0–3-septate, constricted at the central septum, the upper-middle cell slightly swollen and larger, straight or slightly curved, striate, guttulate, surrounded by an irregular mucilaginous sheath (1.5–6 μm wide at both ends and 2–8.5 μm wide on the sides). Asexual morph: *Conidiomata* pycnidial, semi-immersed to immersed, globose, dark, unilocular, thick-walled (dark brown), ostiolate. Conidiomatal wall *textura angularis* to *textura prismatica*, 310–353 μm high, 300–330 μm diam ($\bar{x}$ = 325 × 310 μm, n = 5), peridium 37–93 μm wide. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* holoblastic, cylindrical to ampulliform, hyaline, smooth, thin-walled, septate, single apical conidium, 20–32.3 × 4–7.6 μm, ($\bar{x}$ = 27.6 × 5.7 μm, n = 30). *Conidia* hyaline thin-walled, smooth, rarely guttulate, aseptate, oval, 4.5–6.8 × 4.2–4.5 μm, ($\bar{x}$ = 5.5 × 4.3 μm, n = 40).

Material examined: Thailand, Samut Songkhram Province, on a dead midrib of the leaflet of *Nypa fruticans* (Arecaceae), 11 June 2018, V. Kumar SS16-2 (MFLU 19-2847), living culture, MFLUCC 20-0093.

GenBank: LSU = MT587580, SSU = MT587572, TEF = MT597402

Notes: Members of Striatiguttulaceae are characterized by having immersed to erumpent or superficial ascomata, with a papilla or a short to long neck, ampulliform, subglobose or conical, trabeculate pseudoparaphyses, cylindric-clavate, bitunicate asci, and hyaline to brown, uniseriate to biseriate, fusiform to ellipsoidal, striate and 1–3-septate ascospores. Most morphological observations between the sexual morphs of *Striatiguttula* species are closely related (Zhang et al. 2019, Table 3). Both the sexual and asexual morphs of *Striatiguttula phoenicis* (MFLU 19-2847; MFLUCC 20-0093 and MFLUCC 20-0094) were observed on the same substrate within two months. The asexual morph was observed before the sexual morph (Fig. 1,2). The sexual morph of the new isolate has notable morphological differences compared to the holotype of *S. phoenicis* (MFLUCC 18-0266), such as the size of the ascomata (250–380 × 195–310 vs. 195–580 × 135–390), the width of the peridium (30–90 vs. 10–24), size of the asci (64–128 × 9–13.8 vs. 89–141 × 12–18), shape and size the ascospore (ellipsoidal to fusiform, 13–32 × 6.4–8 vs. fusiform to ellipsoidal, 20–29 × 6–10) (Zhang et al. 2019). However, the asexual morph has overlapping characters with other asexual taxa in Pleosporales (genera in Lophiostomataceae, Lentitheciaceae, Massarinaceae, Morosphaeriaceae, Parabambusicolaceae Tanaka et al. 2015, Hashimoto et al. 2018).

Following suggestions from Li et al. (2015), we used DNA sequence analysis and phylogenetic studies to confirm the establishment of this asexual and sexual morph connection (Fig. 3). Phylogenetic analysis revealed that the new isolate groups with *S. phoenicis* (MFLUCC 18-0266) with maximum statistical support (100% BS/ 1.0BI). There are 0.88% base-pair (8bp out of 912 bp) differences between *S. phoenicis* (MFLUCC 18-0266) and the *S. phoenicis* (20-0093/20-0094) from this study in the TEF gene region. When comparing the ITS sequences of our isolate with *S. phoenicis* MFLUCC 18-0266 (MK035972.1) the identity was relatively high (98.96%) with having 5 (1.04%) bp differences. Hence, despite having some morphological differences, there is a huge similarity between the molecular data (TEF and ITS genes), based on the recommendations provided by Jeewon and Hyde (2016), here we introduce our collection (MFLU 19-2847) as a new host record for *S. phoenicis*.

Rhytidhysteron

The genus, *Rhytidhysteron* was introduced by Spegazzini (1881) to accommodate *Rh. brasiliense* and *Rh. viride* and is typified by *Rh. brasiliense* (Spegazzini 1881, Silva-Hanlin and Hanlin 1999). The genus includes saprobic to weakly pathogenic fungi that grow on woody plants in terrestrial habitats (Yacharoen et al. 2015, Thambugala et al. 2016, Kumar et al. 2019b, De Silva et al. 2020). Currently, 22 species are accepted in this genus (De Silva et al. 2020).

Rhytidhysteron kirshnacephalus Vin. Kumar & T.C. Wen ***sp. nov***. (Fig. 4)

Index Fungorum number: IF557639; *Facesoffungi number*: FoF 08693

Etymology: Refers to the black color pruina, '*kirshna*' = Black (Sanskrit), '*cephalus' =* head (Greek).

Saprobic on dead wood of standing a mangrove tree, *Rhizophora apiculata* Blume. Sexual morph**:** *Ascomata* 1.2–1.8 long × 0.48–0.75 wide × 0.32–0.45 mm high ($\bar{x}$ = 1.4 × 0.62 × 0.3 mm, n = 10), apothecioid, crowded to aggregate, superficial to semi-immersed, subiculum, brown-black, with exposed, lenticular to irregular, brown-black disc, folded along the margins, compressed at the apex, smooth-without striations. *Exciple* 45–90 μm wide ($\bar{x}$ = 65), composed of dark brown to black, thin-walled cells of *textura angularis*. *Hamathecium* comprising 1.9–3.6 μm wide, dense, septate pseudoparaphyses, constricted at the septa, hyaline, unbranched and forming a dark epithecium above the asci, at the apex and enclosed in a gelatinous matrix, hymenium turns blue in Melzer's reagent. *Asci* 72–105 × 7.3–10.5 μm ($\bar{x}$ = 88.5 × 8.8, n = 20), 4–6-spored, bitunicate, cylindrical, short pedicellate, rounded at the apex, with a distinct ocular chamber and J+ apical ring. *Ascospores* 16.5–22 × 6.0–7.5 μm ($\bar{x}$ = 19 × 7.2, n = 30), uniseriate, slightly overlapping, guttulate, hyaline to lightly pigmented when immature, becoming brown when mature, ellipsoidal to fusiform, straight or curved, rounded to slightly pointed at both ends, (1–)3-septate, guttulate, rough wall, constricted at the septum. Asexual morph**:** Undetermined.

Material examined: Thailand, Cha-am District, Phetchaburi Province, on dead twigs of *Rhizophora apiculata* (Rhizophoraceae), 11 January 2018, V. Kumar (MFLU 20-0427, holotype); *ibid.* (BBH isotype), ex-type living culture (MFLUCC 18-1111).

GenBank: LSU= MT612351, ITS= MT712758, TEF= MT674994

Notes: The new isolate, *Rhytidhysteron kirshnacephalus,* is a sister species to *Rhytidhysteron magnoliae* (75% MLBS/1.0 PP Fig. 5). The isolate is characterized by large, conspicuous ascomata with colored pruina (black), and fits well within the species concept of *Rhytidhysteron*. However, *Rhytidhysteron kirshnacephalus* differs in the size of exciple from *Rh. magnoliae* (45–90 vs. 80–100 μm), appearance and size of ascomata (smooth-without striations versus ascomata distinct rough-striations, 1.2–1.8 × 0.48–0.75 × 0.32–0.45 mm vs. 1.2–2.3 × 0.54–0.6 × 0.43–0.55 mm), pruina (black vs. dark brown), the apex of hamathecium (purple vs hyaline) and asci (72–105 × 7.3–10.5 vs. 160–200 × 13–15 μm) (Fig.4, Table 4). We also observed differences in the size and color of the number of ascospores (16.5–22 × 6.0–7.5 vs. 28–30× 10–11 μm, lightly pigmented when immature to brown when mature vs. pale brown to dark brown).

The TEF gene has high discriminatory power than rDNA genes, because of the high level of sequence polymorphism among related species (O'Donnell 2000, Mirhendi et al. 2015). Hereby, the observed genetic distance of TEF gene region between *Rh. kirshnacephalus* and *Rh. magnoliae* was 5% (51 bp), while the LSU differed by 3% (28 bp). Finally, the two species differed by 4 bp (0.6%) in the ITS region. Based on the observed differences between TEF and LSU data, we establish *Rh. kirshnacephalus* as a new species following the recommendations laid down by Jeewon and Hyde (2016).

Lasiodiplodia

This genus comprises 53 species (Dissanayake et al 2017, Hyde et al. 2019), with 66 epithets listed in Index Fungorum (2020). Both sexual and asexual morphs have been reported within the genus (Alves et al. 2008, Tennakoon et al. 2016, Hyde et al. 2019). It is recommended that morphology is unreliable for species differentiation of this genus, but species can be recognized using combined ITS and TEF1-α-αsequence data, however, we performed our analysis with ITS only (Phillips et al. 2013, Slippers et al. 2014, Hyde et al. 2019).

Lasiodiplodia citricola Abdollahz., Javadiand A.J.L. Phillips, Persoonia 25: 4 (2010) (Fig. 6)

Index Fungorum number: IF516777; *Facesoffungi number*: FoF 05084

Saprobic on dead twigs of *Rhizophora apiculata* Blume. Asexual morph *Conidiomata* stromatic, pycnidial, immersed, dark brown to black, covered with dense mycelium, mostly multi-loculate, up to 2 mm diam, solitary, 270–515 × 230–432 µm ($\bar{x}$ = 377×300, n = 10), globose, thin-thick-walled, papillate. *Conidiomatal wall* 4-layered, 90–120 µm wide at the base, 80–110 µm wide on sides. *Paraphyses* flexuous, cylindrical, rough, thin-walled, initially aseptate, becoming up to occasionally 1–2 septate when mature, rounded at apex, occasionally basal, middle or apical cells swollen, 50–80 µm long, 3–4 µm wide ($\bar{x}$ = 65×3, n = 30). *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* holoblastic, discrete, hyaline, rough, thin-walled, ellipsoidal-cylindrical, proliferating per-currently with 1–2 annellations, 18–26 × 3.5–7 µm ($\bar{x}$ = 23×6.5, n = 20). *Conidia* initially hyaline, aseptate, ellipsoid to ovoid, with granular content, both ends broadly rounded, wall thick, 1.5–2.8 µm ($\bar{x}$ =2.5, n=20), becoming pigmented, ovoid, 1-septate with longitudinal striations, 19–26 × 11–14 µm ($\bar{x}$ = 24×12, n = 20). Sexual morph: undetermined.

Material examined: Thailand, Cha-am Province, on dead twigs of *Rhizophora apiculata* Blume (Rhizophoraceae) 11 January 2018, Vin. Kumar, KC12b (MFLU 19-0622), living culture (MFLUCC 18–1115).

GenBank: ITS: MK106111

Notes: *Lasiodiplodia,* currently comprises 53 species. Both sexual and asexual morphs have been reported within the genus. The genus is a member of the family Botryosphaeriaceae, which is well-known and widespread as plant pathogens occurring mostly in tropical and subtropical regions (Punithalingam 1980). Cruywagen et al. (2017) suggested that hybridization between *Lasiodiplodia* species is widespread and further suggested that some of the currently recognized species may be hybrids, e.g., *L. viticola, L. missouriana, L. laeliocattletae,* and *L. brasiliense*. The fungal isolate understudy was obtained from a twig of a mangrove shrub and has been identified as a new host record for *L. citricola* with support from both morphology and phylogenic data (Fig. 7). This isolate clustered with type strain in the present multi-locus phylogeny (Fig. 7). Morphologically the species is slightly different from the ex-type species, *L. citricola* (IRAN 1522C) by having rough conidiogenous cells and smaller aseptate paraphyses. In *L. citricola* (IRAN 1522C), paraphyses are 125µm long, whereas, in *L. citricola* (MFLUCC 19-0622), paraphyses are 50–80 µm long, which might have occurred due to the change in the host and environment. While the conidial characters were overlapping for both the species. The untrimmed sequence of ITS had 6 bp differences when compared with that of *L. citricola* (ex-type IRAN 1522C and MFLUCC 19-0622). Based on its occurrence, the similarity in morphology, and inadequate differences in the molecular data, here we consider our isolate as a new host record for *Lasiodiplodia citricola*.

Diversity of fungi on the aerial parts of mangrove trees worldwide

A list of fungi recorded from the aerial parts of the mangrove trees throughout the world is provided in Table 6. The occurrence of endophytic, pathogenic, and saprobic fungi from the aerial parts indicates their multi-level and variable relations with the host and their lifestyle. We have documented 268 fungi found on the aerial parts of 46 mangrove trees (Table 6).

Previous studies were mainly conducted in limited countries by different groups, which include Brazil, Brunei, India, Malaysia, Pakistan, Philippines, South Africa, Taiwan, and Thailand. Here we have listed out fungi from 44 different countries and regions, including Australia, Bermuda, Brazil, Brunei, Burma, Cuba, Dominican Republic, French Polynesia, Grenada, Hawaii, Hong Kong, India, Indonesia, Japan, Kenya, Madagascar, Malaysia, Mauritius, Mexico, New Guinea, Pakistan, Panama, Papua New Guinea, Philippines, Portugal, Puerto Rico, Puerto Rico, Puerto Rico, Republic of Formosa, Reunion, Sierra Leone, Singapore, Somalia, South Africa, Sri Lanka, Tahiti, Taiwan, Tanzania, Thailand, USA, Venezuela, West Africa, Zambia, Zanzibar. Among these India, Taiwan, and Thailand have the highest number of fungi from the aerial parts (79, 41, and 18, respectively, Table 6). A higher diversity on these mangrove hosts consists of fungi occurring in or on the leaves than branches and roots. In our data, fungi from the genus *Aspergillus* and Pestalotiod group were very common and have a wide distribution. Based on our data, we reckon that the fungal diversity from the aerial parts of the mangrove forests warrants a systematic survey for a correct estimation.

Discussion

In this study, three saprobic fungal species were isolated and identified from the aerial parts of mangrove trees, *Nypa fruiticans,* and *Rhizophora apiculata*, collected from two different provinces of Central Thailand, Cha-am (Phetchaburi) and Samut

Songkhram. New isolates were identified by utilizing morpho-molecular techniques. They are as *Striatiguttula phoenicis*, *Rhytidhysteron Kirshnacephalus* sp. nov., and *Lasiodiplodia citricola*

The three isolates belong to the class Dothediomycetes and fall within different orders *viz.* Pleosporales, Hysteriales, and Botryosphaeriales. The first isolate, *Striatiguttula phoenicis*, falls in a newly circumscribed family Striatiguttulaceae. The second isolate, *Rhytidhysteron kirshnacephalus* sp. nov. is a member of Hysteriaceae and is characterized by its large, conspicuous ascomata. The third isolate belongs to the family Botryosphaeriaceae, and is a known pathogen, *Lasiodiplodia citricola.*

Pleosporales is the largest order within Dothideomycetes with 91 families, of which, 37 have marine representatives (Jones et al. 2019, Brahmanage et al. 2020). Within the 37 families, Striatiguttulaceae was introduced by Zhang et al. (2019) to accommodate species of *Longicorpus* and *Striatiguttula* from mangrove substrates. Currently, there are three species in the family: *Striatiguttula nypae, S. phoenicis*, and *Longicorpus striataspora* (Zhang et al. 2019). *Striatiguttula* is the type genus and is characterized by having immersed, erumpent to superficial stromata, with a papilla or a short to a long neck, trabeculate pseudoparaphyses, bitunicate asci, and hyaline to brown, fusiform to ellipsoidal, striate, guttulate, 1–3-septate ascospores, with paler end cells and surrounded by a mucilaginous sheath (Zhang et al. 2019).

The new strain of *Striatiguttula phoenicis* in this study was isolated from the midrib of the leaflet of *N. fruticans* collected from Samut Songkhram. Morphologically our strain fits well within the species concept of *Striatiguttula* (Zhang et al. 2019). Previously, *S. phoenicis* was reported from *Phoenix paludosa*, which is known to be associated with mangroves and grows on the upper regions of mangrove forests (Teo et al. 2010, Zhang et al. 2019). In our study of fungi from aerial parts of mangrove trees, we isolated *S. phoenicis* from the midrib of a dead leaf from a standing *N. fruticans* in central Thailand. The present report extends the host range of this taxon. Since, in Zhang et al. (2019), the species was isolated from the submerged decaying rachis of *P. paludosa* in Southern Thailand. This suggests that *S. phoenicis* is not limited to one host species perhaps suggesting host jumping in the Arecaceae family though more extensive studies on coevolution are needed. In our isolate, there are slight morphological differences with *S. phoenicis* (MFLUCC 18-0266) viz. ascomatal size, the thickness of peridium, size of the asci, and size and septation of the ascospore (Fig. 1, Table 3). These morphological differences could be due to the occurrence on a different host plant i.e., *N. fruticans.* Through this study, we establish the anamorph to teleomorph connection for *S. phoenicis* through morphological and molecular studies. This is the first report of an anamorph connection reported in the family Striatiguttulaceae (Fig. 2,3). During our study, we observed the asexual morph at first then the sexual morph on the same substrate. This could indicate that *S. phoenicis* reproduces more frequently through the asexual mode of life than through sexual mode (Hyde et al. 2011, Jones et al. 2014).

Rhytidhysteron kirshnacephalus (MFLUCC 18-1111) was collected from the mangroves of Cha-am district, Thailand. It belongs to Hysteriales, which contains only one family, Hysteriaceae. There are three genera of marine or marine-derived fungi in the family: *Gloniella, Hysterium*, and *Rhytidhysteron* (Wijayaward. 2017, Jones et al. 2019, Kumar et al. 2019b). *Rhytidhysteron* was introduced by Spegazzini (1881) and is characterized by large, conspicuous ascomata, usually elongate and boat-shaped and features a prominent, perpendicularly striate margin, in combination with pigmented, sparsely septate to sub-muriform ascospores (Spegazzini 1881, Silva-Hanlin and Hanlin 1999, Thambugala et al. 2016, Kumar et al. 2019b). In the phylogenetic analysis, our isolate (MFLUCC 18-1111) was grouped with *Rh. magnoliae* as a sister taxon and the two can be separated based on the morphological differences, such as appearance and size of exciple, ascomata, pruina, hamathecium. In addition to the morphological differences, we have also observed DNA base-pair differences (5% in TEF from *Rh. magnoliae*) to establish *Rhytidhysteron kirshnacephalus* (MFLUCC 18-1111) as a new species in the genus (Table 4, Fig. 4,5). Although species of *Rhytidhysteron* are widely distributed in tropical and temperate countries such as Brazil, France, Ghana, Kenya, most of them have also been found in Thailand (Thambugala et al. 2016, Kumar et al. 2019b). This is not surprising given its tropical climate and mangrove forests, Thailand has one of the rich diversities of *Rhytidhysteron*. *Rhytidhysteron mangrovei* and *Rh.bruguierae* have also been reported from mangroves. Members belonging to Hysteriales are often reported from mangrove habitats, particularly the aerial parts of the mangrove plant substrate (Devadatha et al. 2018, Kumar et al. 2019b, Dayarathne et al. 2020). The superficial, well-protected wall layers of the ascomata of hysteriales seem to protect from desiccation and solar radiation for their occurrence in the upper parts of the mangrove plants.

Lasiodiplodia citricola (MFLUCC 19-0622) was also found in Cha-am district as a new host record from *Rhizophora apiculata*. It belongs to Botryosphaeriales, which has nine families. Marine species have been found only in Botryosphaeriaceae and Phyllostictaceae, which belong to Botryosphaeriales (Wijayaward. 2017, Jones et al. 2019, Hyde et al. 2019). *Lasiodiplodia* was introduced by Ellis and Everh (1896) and is characterized by the presence of pycnidial conidiomata and longitudinal striations on mature conidia (Sutton 1980, Zhou and Stanosz 2001, Slippers et al. 2004, Phillips et al. 2008, 2013, Prasher and Singh 2014, Hyde et al. 2019). *Lasiodiplodia citricola* seems to be a cosmopolitan fungus, having a broad range of hosts and wide geographic distribution *viz. Citrus latifolia*, (Mexico), *Citrus* sp. (Iran), *Juglans regia* (California), *Pistacia vera* (California), *Prunus persica* (California), and *Vitis vinifera* (Australia, Italy) (USDA, https://nt.ars-grin.gov/fungaldatabases/). Mostly, *L. citricola* is known as a pathogenic fungus, but the new strain was observed as a saprobe on dead twigs of the mangrove tree, indicating the ability of *L. citricola* to adapt to the occurrence on new hosts and diverse lifestyles with saprophytism recorded in the present study. In our phylogenetic analyses, the TEF sequence of the new host record was not included as we were not successful in obtaining it.

The aerial parts of the mangrove trees in the marine environment are excellent habitat to study fungal diversity and ecology. However, when compared with the fungi from submerged marine/intertidal substrates, the number of fungi from the aerial parts is very small (Jones et al. 2019, Table 6). Poonyth et al. (2000) listed 163 fungi from mangrove and mangrove-associated trees. Whereas here we have listed 268 fungi (from 156 genera) from the aerial parts of 46 mangrove trees across 44 different locations (Table 6). Among them, *Aspergillus* (15), *Pseudocercospora* (13), and Pestalotiod fungi (15) are the top three genera to occur on the terrestrial part of the mangrove trees. Based on our data, woody substrata supported a greater number of fungi than leaves and most of them are saprophytes.

This study suggests that future studies should include the examination of fungi found from the aerial parts of mangrove forests and explore their significance. Also, investigations on the underlying mechanism of exhibiting both sexual and asexual morphs and lifestyle switching are required.

Declarations

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Authors' contributions First author and Dr. Sarma VV conceived the idea to include the table containing data for the fungi from the aerial part; Dr. Kasun Thambugala provided his insights on Rhytidhysteron species and Dothideomycetes group; Vinit Kumar wrote the manuscript with contributions from all other authors including Dr. R Cheewangkoon and Dr. Ting Chi Wen. Dr. Ting Chi Wen provided support with the molecular studies.

Data availability Sequence data have been deposited in GenBank. The new isolate has been registered in Index Fungorum and FaceOfFungi.

Ethics approval and consent to participate Not applicable.

Competing interests The authors declare that they have no competing interests

References

Alias SA, Jones EB (2009) Marine fungi from mangroves of Malaysia. Institute of Ocean and Earth Sciences, University of Malaya.

Alias SA, Jones EG, Torres J (1999) Intertidal fungi from the Philippines, with a description of *Acrocordiopsis sphaerica* sp. nov. (Ascomycota). Fungal Diversity 2:35–41.

Alves A, Crous PW, Correia A, Phillips AJ (2008) Morphological and molecular data reveal cryptic speciation in *Lasiodiplodia theobromae*. Fungal Diversity 28:1–3.

Ananda K, Sridhar KR (2002) Diversity of endophytic fungi in the roots of mangrove species on the west coast of India. Canadian Journal of Microbiology. 48(10):871–8.

Batista AC, da Silvia Maia H, Fernandes Vital A (1955) *Ascomycetidae aliquot novarum* (Some new ascomycetes). An Soc Biol Pernambuco 13:72–86.

Berkeley MJ, Broome CE (1871) The Fungi of Ceylon. Journal of the Linnean Society of London Botany. 56:494–567.

Berkeley MJ. Australian Fungi.—II (1881) Received principally from Baron F. von Mueller. Botanical Journal of the Linnean Society 18:383–9.

Besitulo A, Moslem MA, Hyde KD (2010) Occurrence and distribution of fungi in a mangrove forest on Siargao Island, Philippines. Botanica Marina 53(6):535–43.

Bitancourt AA (1937) New species of *Sphaceloma* on *Terminalia* and Genipa. Arch Inst biol Def agric anim 8(13).

Boidin J, Gilles G (1991) *Basidiomycètes Aphyllophoralesde l'île de la Réunion*. XVI: *Les genresHyphoderma, Hyphodermopsis, Chrysoderma* nov. gen. et *Crustoderma*. Cryptogamie Mycologie 12:97–132.

Borse BD (1988) Frequency of occurrence of marine fungi from Maharashtra coast, India. NISCAIR-CSIR, India 165-167.

Cash EK (1938) New records of Hawaiian discomycetes. Mycologia 30:97–107.

Castillo Cabello G (1994) A new species of trametes from Papua New Guinea. Mycotaxon 51: 479–482.

Chaeprasert S, Piapukiew J, Whalley AJ, Sihanonth P (2010) Endophytic fungi from mangrove plant species of Thailand: their antimicrobial and anticancer potentials. Botanica Marina 53(6):555–64.

Chi WC, Chen W, He CC, Guo SY, Cha HJ, Tsang LM, Ho TW, Pang KL (2019) A highly diverse fungal community associated with leaves of the mangrove plant *Acanthus ilicifolius var. xiamenensis* revealed by isolation and metabarcoding analyses. PeerJ. 7:e7293.

Chomnunti P, Hongsanan S, Aguirre–Hudson B, Tian Q, Peršoh D, Dhami MK, Alias AS, Xu J, Liu X, Stadler M, Hyde KD (2014) The sooty moulds. Fungal Diversity 66(1):1–36.

Chowdhery HJ, Rai JN (1980) Microfungi from mangrove swamps of West Bengal, India. II. Some new records of aquatic fungi. Nova Hedwigia 32:237–242.

Chupp, C. (1954). A Monograph of the Fungus Genus Cercospora. 1–667.

Ciferri R (1954) *Meliolae* of Santo Domingo (WI). Mycopathologia et mycologia applicate 7(1-2):81–211.

Ciferri R, Gonzalez Fragoso R (1926) Hongos parasitos y saprófitos de la República Dominicana (7a serie). Boletín de la Real Sociedad Española de Historia Natural 26:470–480.

Ciferri R, Gonzalez Fragoso R (1928) Hongos parasitos y saprófitos de la República Dominicana (13 & 14a serie). Boletín de la Real Sociedad Española de Historia Natural 28:131–144.

Clendenin I (1896) *Lasiodiplodia* Ellis and Everh. n. gen. Botanical Gazette Crawfordsville 21:92–93.

Cooke MC (1876) Some Indian fungi. Grevillea. 4:114–8.

Corner EH (1991) Ad Polyporaceas VII: the xanthochroic polypores. Beihefte zur Nova Hedwigia 101:177.

Costa IP, Maia LC, Cavalcanti MA (2012) Diversity of leaf endophytic fungi in mangrove plants of northeast Brazil. Brazilian Journal of Microbiology. 43(3):1165–73.

Creager DB (1962) A new *Cercospora* on *Rhizophora mangle*. Mycologia 54(5):536–9.

Cruywagen EM, Slippers B, Roux J, Wingfield MJ (2017) Phylogenetic species recognition and hybridisation in *Lasiodiplodia*: a case study on species from baobabs. Fungal biology. 121(4):420–36.

Dayarathne MC, Jones EB, Maharachchikumbura SS, Devadatha B, Sarma VV, Khongphinitbunjong K, Chomnunti P, Hyde KD (2020) Morpho–molecular characterization of microfungi associated with marine based habitats. Mycosphere 11(1):1–88.

Dayarathne MC, Wanasinghe DN, Jones EG, Chomnunti P, Hyde KD (2018) A novel marine genus, *Halobyssothecium* (Lentitheciaceae) and epitypification of *Halobyssothecium obiones* comb. nov. Mycological Progress 17(10):1161–71.

Deighton FC (1976) Studies on *Cercospora* and allied genera. VI. *Pseudocercospora* Speg., *Pantospora* Cif. and *Cercoseptoria* Petr. Mycological Papers 140:1–168.

Devadatha B, Mehta N, Wanasinghe DN, Baghela A, Sarma VV (2019) *Vittaliana mangrovei*, gen. nov., sp. nov. (Phaeosphaeriaceae) from mangroves near Pondicherry (India), based on morphology and multigene phylogeny. Cryptogamie Mycologie 40 (7):117–132.

Devadatha B, Sarma VV (2018) *Pontoporeia mangrovei* sp. nov, a new marine fungus from an Indian mangrove along with a new geographical and host record of *Falciformispora lignatilis*. Current Research in Environmental and Applied Mycology 8(2):238–46.

Devadatha B, Sarma VV, Ariyawansa HA, Jones EG (2018) *Deniquelata vittalii* sp. nov., a novel Indian saprobic marine fungus on Suaeda monoica and two new records of marine fungi from Muthupet mangroves, East coast of India. Mycosphere 9:565–582.

Devadatha B, Sarma VV, Jeewon R, Jones EG (2018) *Morosphaeria muthupetensis* sp. nov. (Morosphaeriaceae) from India: morphological characterization and multigene phylogenetic inference. Botanica marina 61(4):395–405.

Devadatha B, Sarma VV, Jeewon R, Wanasinghe DN, Hyde KD, Jones EG (2018) *Thyridariella*, a novel marine fungal genus from India: morphological characterization and phylogeny inferred from multigene DNA sequence analyses. Mycological progress 17(7):791–804.

Dissanayake AJ, Camporesi E, Hyde KD, Yan JY, Li XH (2017) Saprobic Botryosphaeriaceae, including *Dothiorella italica* sp nov., associated with urban and forest trees in Italy. Mycosphere 8(2):1157–76.

Earle FS (1901) Some fungi from Porto Rico. Muhlenbergia 1:10–17.

Ellis JB, Everhart BM (1895) New species of fungi from various localities. Proceedings of the Academy of Natural Sciences of Philadelphia 1:413–41.

Gilbertson RL, Adaskaveg JE (1993) Studies on wood-rotting basidiomycetes of Hawaii. Mycotaxon 49(1):369–97.

Guerrero JJ, General MA, Serrano JE (2018) Culturable Foliar Fungal Endophytes of Mangrove Species in Bicol Region, Philippines. Philippine Journal of Science. 147(4):563–74.

Hall TA (1999) BioEdit: a user–friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. In Nucleic acids symposium series 41:95–98).

Hamzah TN, Lee SY, Hidayat A, Terhem R, Faridah–Hanum I, Mohamed R (2018) Diversity and characterization of endophytic fungi isolated from the tropical mangrove species, *Rhizophora mucronata*, and identification of potential antagonists against the soil–borne fungus, Fusarium solani. Frontiers in microbiology. 9:1707.

Hansford CG (1946) The foliicolous ascomycetes, their parasites and associated fungi. Mycological Papers 15:1–240.

Hansford CG (1956, publ. 1957) Tropical fungi. VI. New species and revisions. Sydowia 10:41–100.

Hennings PC (1902) Fungi Javanici novi a cl. Prof. Dr Zimmermann collecti. Hedwigia 41:140–149.

Hennings PC (1902, publ. 1903) Botanische Ergebnisse. Fungi. In Baum, H. [ed.], Kunene-Sambesi-Expedition pp. 155–169.

Hennings PC (1904) Fungi Fluminenses a. cl. E. Ule collecti. Hedwigia 43:78–95.

Hennings PC (1908) Fungi S. Paulenses IV. a cl. Puttemans collecti. Hedwigia 48:1–20.

Ho WH and Hyde KD (1996) *Pterosporidium* gen. nov. to accommodate two species of *Anthostomella* from mangrove leaves. Canadian Journal of Botany 74 (11):1826–1829.

Hsieh WH, Goh TK (1990) *Cercospora* and Similar Fungi from Taiwan. 1–376. Taiwan, Taipei; Maw Chang Book Company.

Hyde KD (1988) Observations on the vertical distribution of marine fungi on *Rhizophora* spp. at Kampong Danau mangrove, Brunei. Asian Mar. Biol 5:77–81.

Hyde KD (1990) A study of the vertical zonation of intertidal fungi on *Rhiziphora apiculata* at Kampong Kapok mangrove, Brunei. Aquatic botany 36(3):255–62.

Hyde KD, Cannon PF (1992) *Polystigma sonneratiae* causing leaf spots on the mangrove genus *Sonneratia*. Australian Systematic Botany 5(4):415–20.

Hyde KD, Lee SY (1995) Ecology of mangrove fungi and their role in nutrient cycling: what gaps occur in our knowledge? Hydrobiologia. 295(1–3):107–18.

Hyde KD, Alias SA (1999) *Linocarpon angustatum* sp. nov., and *Neolinocarpon nypicola* sp. nov. from petioles of *Nypa fruticans*, and a list of fungi from aerial parts of this host. Mycoscience 40(2):145–9.

Hyde KD, Goh TK, Lu BS, Alias SA (1999) Eleven new intertidal fungi from *Nypa fruticans*. Mycological Research 103(11):1409–22.

Hyde KD, Alias SA (2000) Biodiversity and distribution of fungi associated with decomposing *Nypa fruticans*. Biodiversity and Conservation. 9(3):393–402.

Hyde KD, Sarma VV (2006) Biodiversity and ecological observations on filamentous fungi of *Nypa fruticans* along the Tutong River, Brunei. Indian Journal of Marine Sciences. 35:297–307.

Hyde KD, Tennakoon DS, Jeewon R, Bhat DJ, Maharachchikumbura SS, Rossi W, Leonardi M, Lee HB, Mun HY, Houbraken J, Nguyen TT (2019) Fungal diversity notes 1036–1150: taxonomic and phylogenetic contributions on genera and species of fungal taxa. Fungal diversity 96(1):1–242.

Hyde KD. Studies on the tropical marine fungi of Brunei. Botanical Journal of the Linnean Society. 1988 Oct 1;98(2):135–51.

Index Fungorum (2020) Available from: http://www.indexfungorum.org/names/names.asp (accessed August 2020)

Isaka M, Yangchum A, Intamas S, Kocharin K, Jones EG, Kongsaeree P, Prabpai S (2009) Aigialomycins and related polyketide metabolites from the mangrove fungus *Aigialus parvus* BCC 5311. Tetrahedron. 65(22):4396–403.

Ito S, Imai S (1940) Fungi of the Bonin Islands. V. Transactions Sapporo nat Hist Soc 16:120–38.

Ito T, Nakagiri A (1997) Mycoflora of the rhizospheres of mangrove trees. IFO Reearch Communications 18:40–4.

Jayasiri SC, Hyde KD, Ariyawansa HA, Bhat J, Buyck B, Cai L, Dai YC, Abd–Elsalam KA, Ertz D, Hidayat I, Jeewon R (2015) The Faces of Fungi database: fungal names linked with morphology, phylogeny and human impacts. Fungal diversity 74(1):3–18.

Jeewon R, Hyde KD (2016) Establishing species boundaries and new taxa among fungi: recommendations to resolve taxonomic ambiguities. Mycosphere 7(11):1669–77.

Jones EG, Abdel–Wahab MA (2005) Marine fungi from the Bahamas Islands. Botanica Marina 48(5–6):356–64.

Jones EG, Devadatha B, Abdel-Wahab MA, Dayarathne MC, Zhang SN, Hyde KD, Liu JK, Bahkali AH, Sarma VV, Tibell S, Tibell L. (2019) Phylogeny of new marine Dothideomycetes and Sordariomycetes from mangroves and deep-sea sediments. Botanica Marina 63(2):155–81.

Jones EG, Pang KL, Abdel–Wahab MA, Scholz B, Hyde KD, Boekhout T, Ebel R, Rateb ME, Henderson L, Sakayaroj J, Suetrong S (2019) An online resource for marine fungi. Fungal Diversity 96(1):347–433.

Kar AK, Mandal M (1969) New *Cercospora* spp. from West Bengal. Transactions of the British mycological Society 53(3):337–60.

Kar AK, Mandal M (1973) New *Cercospora* spp. from West Bengal. III. Indian Phytopathology 26(4): 674–680.

Karsten PA, Hariot P (1890) Ascomycetes novi. Revue Mycologique Toulouse 12(48): 169–173.

Katoh K, Standley DM (2013) MAFFT multiple sequence alignment software version 7: improvements in performance and usability. Molecular biology and evolution 30(4):772–80.

Katumoto K, Harada Y (1979) Plant parasitic fungi from the Bonin Islands. II. Ascomycotina and Deuteromycotina. Trans Mycol Soc Japan 20:411–428.

Kobayashi T, Onuki M (1990) Notes on some new or noteworthy fungi parasitic to woody plants from the Yaeyama Islands, Kyushu, Japan. Reports of the Tottori Mycological Ins 28:159–69.

Koehn RD, Garrison RA (1981) Fungi associated with *Avicennia germinans* from the vicinity of Port Aransas, Texas. Mycologia 73(6):1183–6.

Kohlmeyer J (1969) Ecological notes on fungi in mangrove forests. Transactions of the British Mycological Society 53(2):237–IN5.

Kohlmeyer J (1979) Marine fungal pathogens among Ascomycetes and Deuteromycetes. Experientia 35(4):437–9.

Kohlmeyer J, Bebout B, Vlkmann-Kohlmeyer B (1995) Decomposition of mangrove wood by marine fungi and teredinids in Belize. Marine Ecology 16(1):27–39.

Kohlmeyer J, Volkmann–Kohlmeyer B, Eriksson OE (1996) Fungi on *Juncus roemerianus*. New marine and terrestrial ascomycetes. Mycological Research 100(4):393–404.

Kohlmeyer J, Volkmann–Kohlmeyer B, Eriksson OE (1997) Fungi on *Juncus roemerianus*. 9. New obligate and facultative marine ascomycotina. Botanica Marina 40:291–300.

Koorders SH (1907) Botanische Untersuchungen über einige in Java vorkommende Pilze, besonders über Blätter bewohnende, parasitisch auftretende Arten. Verhandelingen der Koninklijke Akademie van Vetenschappen te Amsterdam Sect 13 (4): 1–264.

Kumar V, Cheewangkoon R, Gentekaki E, Maharachchikumbura SS, Brahmanage RS, Hyde KD (2019a) *Neopestalotiopsis alpapicalis* sp. nov. a new endophyte from tropical mangrove trees in Krabi Province (Thailand). Phytotaxa 393(3):251–62.

Kumar V, Cheewangkoon R, Thambugala KM, JONES GE, Brahmanage RS, Doilom M, Jeewon R, Hyde KD (2019b) *Rhytidhysteron mangrovei* (Hysteriaceae), a new species from mangroves in Phetchaburi Province, Thailand. Phytotaxa 401(3):166–78.

Kumaresan V, Suryanarayanan TS (2001) Occurrence and distribution of endophytic fungi in a mangrove community. Mycological Research. 105(11):1388–91.

Kumaresan V, Suryanarayanan TS (2002) Endophyte assemblagesin young, mature and senescent leaves ofRhizophora apiculata:evidence for the role of endophytes in mangrove litter degra-dation. Fungal Diversity 9:81–91.

Kumaresan V, Suryanarayanan TS (2001) Occurrence and distribution of endophytic fungi in a mangrove community. Mycological Research 105:1388–1391.

Kuthubutheen AJ (1981) Fungi associated with the aerial parts of Malaysian mangrove plants. Mycopathologia 76(1):33.

Kuthubutheen AJ (1984) Leaf surface fungi associated with *Avicennia alba* and *Rhizophora mucronata* in Malaysia. In: Proceedings of the Asian Symposium on Mangrove Environment- Research and Management, pp 153–171.

Kuthubutheen AJ, Nawawi A (1991) Eight new species of *Dictyochaeta* (Hyphomycetes) from Malaysia. Mycological Research 95(10):1211–9.

Lee BKH, Baker G E (1972) An ecological study of the soil microfungi in a Hawaiian mangrove swamp. Pacific Science 26:1–10.

Leong WF, Tan TK, Jones EBG (1988) Lignicolous marine fungi of Singapore. Canadian Journal of Botany 66 (11):2167–2170.

Li WJ, Bhat DJ, Camporesi E, Tian Q, Wijayawardene NN, Dai DQ, Phookamsak R, Chomnunti P, Bahkali AH, Hyde KD (2015) New asexual morph taxa in Phaeosphaeriaceae. Mycosphere 6(6):681–708.

Liu JK, Hyde KD, Jeewon R, Phillips AJ, Maharachchikumbura SS, Ryberg M, Liu ZY, Zhao Q (2017) Ranking higher taxa using divergence times: a case study in Dothideomycetes. Fungal Diversity 84(1):75–99.

Loganathachetti DS, Poosakkannu A, Muthuraman S (2017) Fungal community assemblage of different soil compartments in mangrove ecosystem. Scientific reports 7(1):1–9.

Loilong A, Sakayaroj J, Rungjindamai N, Choeyklin R, Jones EG (2012) 15 Biodiversity of fungi on the palm *Nypa fruticans*. Marine Fungi: and Fungal–like Organisms 31:273.

Luke P, Reddy CN (1979) A new leafspot disease of Thespesia populnea (L.) Soland ex Corr. Current Science 48 (13): 590–591.

Manimohan P, Amritha M, Sairabanu NK (2011) A comparison of diversity of marine fungi on three co–habiting mangrove plants. Mycosphere 2(5):533–8.

Maria GL, Sridhar KR (2003) Diversity of filamentous fungi on woody litter of five mangrove plant species from the southwest coast of India. Fungal Diversity 14(14):109–26.

McAlpine D (1897) Two additions to the fungi of New South Wales. Proceedings of the Linnean Society of New South Wales 22: 722–724.

Mercado Sierra Á (1984) Nueva especie de *Capnobotrys* (Hyphomycetes) de la fumagina en Cuba. Acta Botánica Cubana 23: 1–5.

Meyers SP, Orpurt PA, Simms J, Boral LL (1965) Thalassiomycetes VII. Observations on fungal infestation of turtle grass, *Thalassia testudinum* König. Bulletin of Marine Science 15(3):548–64.

Miller MA, Pfeiffer W, Schwartz T (2012) The CIPRES science gateway: enabling high–impact science for phylogenetics researchers with limited resources. In Proceedings of the 1st Conference of the Extreme Science and Engineering Discovery Environment: Bridging from the extreme to the campus and beyond 16:1–8.

Murrill WA (1908) Additional Philippine Polyporaceae. Bulletin of the Torrey Botanical Club 35:391–416.

Nambiar GR, Raveendran K (2009) Manglicolous marine fungi on *Avicennia* and *Rhizophora* along Kerala coast (India). Middle East J Sci Res 4:48–51.

Nayak BK, Anandhu R (2017) Biodiversity of Phylloplane and Endophytic Fungi from Different Aged Leaves of Medicinal Mangrove Plant Species, *Avicennia marina*. Journal of Pharmaceutical Sciences and Research. 9(1):6.

Newell SY (1973) Succession and role of fungi in the degradation of red mangrove seedlings. In: Stevenson LH, Colwell RR (eds) Estuarine microbiol ecology. Univ. of South Carolina Press, Columbia, pp 467–480.

Newell SY (1976) Mangrove fungi: the succession in the mycoflora of red mangrove (Rhisophora mangle L.) seedlings. In: Jones EBG (ed) Recent advances in aquatic mycology. Paul Elek Ltd., London, pp 51–91.

Newell SY, Fell JW (1980) Mycoflora of turtlegrass (Thalassia testudinum Konig) as recorded after seawater incubation. Botanica Marina 23:265–275.

Norphanphoun C, Raspé O, Jeewon R, Wen TC, Hyde KD (2018) Morphological and phylogenetic characterisation of novel *Cytospora* species associated with mangroves. MycoKeys 38:93.

Norphanphoun C, Jayawardena RS, Chen Y, Wen TC, Meepol W, Hyde KD (2019) Morphological and phylogenetic characterization of novel pestalotioid species associated with mangroves in Thailand. Mycosphere. 10:531–578.

Nylander J (2004) MrModeltest V2. Program Distributed by the Author. Bioinformatics. 24:581–583.

Olive LS (1958) The Lower Basidiomycetes of Tahiti [Continued]. Bulletin of the Torrey Botanical Club. Mar 1;85(2):89–110.

Olive LS (1957) Tulasnellaceae of Tahiti. A revision of the family. Mycologia 49 (5): 663–679.

Osorio JA, Crous CJ, De Beer ZW, Wingfield MJ, Roux J (2017) Endophytic Botryosphaeriaceae, including five new species, associated with mangrove trees in South Africa. Fungal biology 121(4):361–93.

Pang KL, Hyde KD, Alias SA, Suetrong S, Guo SY, Idid R, Jones EG (2013) Dyfrolomycetaceae, a new family in the Dothideomycetes, Ascomycota. *Cryptogamie, Mycologie* 34(3):223–32.

Pang KL, Sharuddin SS, Alias SA, Nor NA, Awaluddin HH (2010) Diversity and abundance of lignicolous marine fungi from the east and west coasts of Peninsular Malaysia and Sabah (Borneo Island). Botanica Marina 53(6):515–23.

Patouillard N (1916) Une lépiote Africaine des nids de termites (Lepiota letestui). Bulletin Trimestriel de la Société Mycologique de France 32:59–62.

Petch T (1925) Additions to Ceylon fungi. III. Annals of the Royal Botanic Gardens, Peradeniya 9(3):313–328.

Petrak F (1928) Über Englerula und die Englerulaceen. Annales Mycologici 26(5-6):385–413.

Petrak F, Ciferri R (1930) Fungi Dominicani [Dominican fungi]. Annales Mycologici 28 (5-6):377–420.

Petrak F, Ciferri R (1932) Fungi Dominicani. II. Annales Mycologici 30(3-4):149–353.

Phillips AJ, Alves A, Abdollahzadeh J, Slippers B, Wingfield MJ, Groenewald JZ, Crous PW (2013) The Botryosphaeriaceae: genera and species known from culture. Studies in mycology 76:51–167.

Phillips AJ, Alves A, Pennycook SR, Johnston PR, Ramaley A, Akulov A, Crous PW (2008) Resolving the phylogenetic and taxonomic status of dark–spored teleomorph genera in the Botryosphaeriaceae. Persoonia: Molecular Phylogeny and Evolution of Fungi 21:29.

Poon MO, Hyde KD (1998) Biodiversity of intertidal estuarine fungi on Phragmites at Mai Po marshes, Hong Kong. Botanica marina 41:141–155.

Poonyth AD, Hyde KD, Aptroot A, Peerally A (2000) *Mauritiana rhizophorae* gen. et sp. nov. (Ascomycetes, Requienellaceae), with a list of terrestrial saprobic mangrove fungi. Fungal Diversity 4:101–116.

Prasher IB, Singh G (2014) *Lasiodiplodia indica*–A new species of coelomycetous mitosporic fungus from India. Kavaka 43:64–9.

Punithalingam E (1980) Plant diseases attributed to *Botryodiplodia theobromae* Pat. J. Cramer p121. In: Plant diseases attributed to Botryodiplodia theobromae Pat., pp 123 pp. ref.324.

Raciborski M (1909) Parasitische und epiphytische Pilze Javas. Bulletin de l'Académie des Sciences de Cracovie Classe des Sciences Mathématiques et Naturelles 346–394.

Rai JN Tewari JP Mukerji KG (1969) Mycoflora of mangrove mud. Mycopathologia et Mycologia Applicata 38:17–31.

Rajamani T, Suryanarayanan TS, Murali TS, Thirunavukkarasu N (2018) Distribution and diversity of foliar endophytic fungi in the mangroves of Andaman Islands, India. Fungal ecology. 36:109–16.

Rambaut A (2012) FigTree v.1.4.2: Tree Figure Drawing Tool. Available online at: http://tree.bio.ed.ac.uk/software/figtree (Accessed November 28, 2020).

Rao R (1966) A new species of Tryblidaria from India. Mycopathologia et Mycologia Applicata 28(4):359–360.

Raveendran, K. and Manimohan, Patinjareveettil (2007) Marine Fungi of Kerala, A Preliminary Floristic and Ecological Study. 10.13140/2.1.3699.8084.

Rehm HJ (1901) Beiträge zur Pilzflora von Südamerika. XII. Sphaeriales. Hedwigia 40:100–124.

Rehm HJ (1913). Ascomycetes Philippinenses collecti a clar. C.F. Baker. Philippine Journal of Science Section C, Botany 8(3):181–194.

Rehner SA, Buckley E (2005) A *Beauveria* phylogeny inferred from nuclear ITS and EF1–α sequences: evidence for cryptic diversification and links to Cordyceps teleomorphs. Mycologia 97(1):84–98.

Rehner SA, Samuels GJ (1994) Taxonomy and phylogeny of *Gliocladium* analysed from nuclear large subunit ribosomal DNA sequences. Mycological Research 98(6):625–34.

Reichardt HW (1870) Fungi, hepaticae et musci frondosi. Kaiserlich-Königlichen Hof-und Staatsdruckerei 1:133–196.

Roane MK (1986) Taxonomy of the genus Endothia. In: Roane, M.K.; Griffin, G.J.; Elkins, J.R. [eds], Chestnut Blight, other Endothia Diseases, and the Genus Endothia. USA, Minnesota, St Paul; American Phytopathological Society, pp 28–39.

Ronquist F, Huelsenbeck J, Teslenko M (2011) Draft MrBayes version 3.2 manual: tutorials and model summaries. Distributed with the software from http://brahms. biology. rochester. edu/software. Html 15:1–05.

Rozainah MZ, Aslezaeim N (2010) A demographic study of a mangrove palm, *Nypa fruticans*. Scientific Research and Essays 5(24):3896–902.

Saccardo PA (1918) 1. Fungi *Singaporenses Bakeriani*. 2. Fungi *Abellinenses novi*. Bollettino dell'Orto Botanico dell R. Università di Napoli 6:39–73.

Sakayaroj J, Preedanon S, Supaphon O, Jones EG, Phongpaichit S (2010) Phylogenetic diversity of endophyte assemblages associated with the tropical seagrass *Enhalus acoroides* in Thailand. Fungal Diversity 42(1):27–45.

Sakayaroj J, Supaphon O, Jones EG, Phongpaichit S (2011) Diversity of higher marine fungi at Hat Khanom–Mu Ko Thale Tai National Park, Southern Thailand. Songklanakarin Journal of Science and Technology 33(1).

Samuels, G. J. and Müller, E (1980; '1979') Life–history studies of Brazilian ascomycetes 7: *Rhytidhysteron rufulum* and the genus *Eutryblidiella*. Sydowia 32: 277–292.

Sarma VV (2018) Obligate Marine Fungi and Bioremediation. In: Prasad R. (eds) Mycoremediation and Environmental Sustainability. Fungal Biology, Springer Cham, pp. 307–323.

Sarma VV, Hyde KD (2001) A review on frequently occurring fungi in mangroves. Fungal Divers 8:1–34.

Sarma VV, Hyde KD (2018) Fungal species consortia on *Nypa fruticans* at Brunei. Studies in Fungi 3:19–26.

Sarma VV, Vittal BP (2001) Biodiversity of manglicolous fungi on selected plants in the Godavari and Kirshna deltas, east coast of India. Fungal diversity 6:115–30.

Sawada K (1959) Descriptive catalogue of Taiwan (Formosan) fungi. Part XI. Spec. Publ Coll. Agric. Taiwan Univ 8: 1–268.

Sawada K (1942) Descriptive Catalogue of the Formosan Fungi Part 7. Descriptive Catalogue of the Formosan Fungi Part 7:108-128.

Schmit JP, Shearer CA (2003) A checklist of mangrove-associated fungi, their geographical distribution and known host plants. Mycotaxon 85(1):423–77.

Schneider CA, Rasband WS, Eliceiri KW (2012) NIH Image to ImageJ: 25 years of image analysis. Nature methods (7):671–5.

Seymour AB (1929) Host Index of the Fungi of North America. i-xiii, USA, Massachusetts, Cambridge; Harvard University Press 1-732.

Shear CL, Stevens ME, Wilcox MS (1924) *Botryosphaeria* and *Physalospora* on currant and apple. Journal of Agricultural Research 28:589–598.

Singer R (1988) Über einige Crepidotaceae. Zeitschrift für Mykologie 54(1):69–72.

Slippers B, Fourie G, Crous PW, Coutinho TA, Wingfield BD, Wingfield MJ (2004) Multiple gene sequences delimit Botryosphaeria australis sp. nov. from B. lutea. Mycologia 96(5):1030–41.

Slippers B, Roux J, Wingfield MJ, Van der Walt FJ, Jami F, Mehl JW, Marais GJ (2014) Confronting the constraints of morphological taxonomy in the Botryosphaeriales. Persoonia: Molecular Phylogeny and Evolution of Fungi 33:155.

Soni KK, Dadwal, VS, Jamaluddin (1983). Three new Sphaeropsidales from India. Current Science 52(12):601–603.

Soto–Medina EA, Lücking R, Torres AM (2018) Nuevos registros de líquenes (Familia Graphidaceae) para Colombia. Biota Colombiana 18(2):30–42.

Stamatakis A (2006) RAxML–VI–HPC: maximum likelihood–based phylogenetic analyses with thousands of taxa and mixed models. Bioinformatics 22(21):2688–90.

Stamatakis A, Hoover P, Rougemont J (2008) A rapid bootstrap algorithm for the RAxML web servers. Systematic biology 57(5):758–71.

Stevens NE (1926) Two species of *Physalospora* on Citrus and other hosts. Mycologia 18(5):206–17.

Stevens FL (1916) The genus *Meliola* in Porto Rico. Illinois Biological Monographs 2(4):475–554.

Stevens FL (1920) Dothideaceous and other Porto Rican fungi. Botanical Gazette 69:248–257.

Stevens FL (1928) The Meliolineae. II. Annales Mycologici 26(3-4):165–383.

Subramanian CV (1992) *Tretocephala decidua* gen. et sp.nov., an interesting new hyphomycete. *Cryptogamie Mycologie* 13 (1):65–68.

Suetrong S, Sakayaroj J, Phongpaichit S, Jones EG (2010) Morphological and molecular characteristics of a poorly known marine ascomycete, *Manglicola guatemalensis* (Jahnulales: Pezizomycotina; Dothideomycetes, Incertae sedis): new lineage of marine ascomycetes. Mycologia 102(1):83–92.

Suetrong S, Schoch CL, Spatafora JW, Kohlmeyer J, Volkmann–Kohlmeyer B, Sakayaroj J, Phongpaichit S, Tanaka K, Hirayama K, Jones EB (2009) Molecular systematics of the marine Dothideomycetes. Studies in Mycology 64:155–73.

Suryanarayanan TS, Kumaresan V, Johnson JA (1998) Foliar fungal endophytes from two species of the mangrove *Rhizophora*. Canadian Journal of Microbiology. 1003–1006.

Suryanarayanan T, Kumaresan V (2002) Endophytic assemblage in young, mature and senescent leaves of *Rhizophora apiculata*: evidence for the role of endophytes in mangrove community. Fungal diversity. 9:81–91.

Suryanarayanan TS, Kumaresan V (2000) Endophytic fungi of some halophytes from an estuarine mangrove forest. Mycological Research. 104(12):1465–7.

Sutton BC (1980) The coelomycetes. Fungi *imperfecti* with *pycnidia, acervuli* and stromata. Commonwealth Mycological Institute.

Sutton BC (1991) Notes on deuteromycetes. III. Sydowia 43:264–280.

Sydow (1916) Mycotheca Germanica fasc. XXVII – XXVIII. Annales Mycologici 14 (3-4):243–247.

Sydow H, Petrak F (1931) *Micromycetes Philippinenses*. Series secunda. Annales Mycologici 29(3-4):145–279.

Sydow H, Sydow P (1914) Fungi from northern Palawan. Philippine Journal of Science Section C, Botany 9(2):157–189.

Sydow H, Sydow P, Butler EJ (1916) Fungi Indiae orientalis (pars V). Annales Mycologici 14(3-4):177–220.

Tariq MA, Dawar SH, Mehdi FS (2006) Occurrence of fungi on mangrove plants. Pakistan Journal of Botany. 38(4):1293.

Tassi A (1899) Novae micromycetum species descriptae et iconibus illustratae. VI. Bollettino del Laboratorio Orto Bot. de R. Univ. Siena N.S. 2:139–162.

Tennakoon DS, Phillips AJ, Phookamsak R, Ariyawansa HA, Bahkali AH, Hyde KD. Sexual morph of *Lasiodiplodia pseudotheobromae* (Botryosphaeriaceae, Botryosphaeriales, Dothideomycetes) from China. Mycosphere 7: 990–1000.

Teo S, Ang WF, Lok AF, Kurukulasuriya BR, Tan HT (2010) The status and distribution of the Nipah Palm, *Nypa fruticans* Wurmb (Arecaceae), In Singapore. Nat. Singap. 3:45–52.

Thambugala KM, Hyde KD, Eungwanichayapant PD, Romero AI, Liu ZY (2016) Additions to the genus *Rhytidhysteron* in Hysteriaceae. Cryptogamie, Mycologie 37(1):99–116.

Thambugala KM, Hyde KD, Tanaka K, Tian Q, Wanasinghe DN, Ariyawansa HA, Jayasiri SC, Boonmee S, Camporesi E, Hashimoto A, Hirayama K (2015) Towards a natural classification and backbone tree for Lophiostomataceae, Floricolaceae, and Amorosiaceae fam. nov. Fungal Diversity 74(1):199–266.

Thatoi H, Behera BC, Mishra RR (2013) Ecological role and biotechnological potential of mangrove fungi: a review. Mycology 4(1):54–71.

Thorati M, Mishra JK, Kumar S (2016) Isolation, identification of endophytic Fungi from mangrove roots along the coast of South Andaman Sea, Andaman and Nicobar Islands, India. J Mar Biol Oceanogr 2:2.

Tracy SM, Earle FS (1895) Mississippi fungi. Bulletin. Mississippi Agricultural and Mechanical College Experiment Station 34:80–124.

Viennot-Bourgin G (1963) Micromycetes parasites nouveaux récoltés a Madagascar. Bulletin Trimestriel de la Société Mycologique de France 18(1):96–108.

Vinit K, Doilom M, Wanasinghe DN, Bhat DJ, Brahmanage RS, Jeewon R, Xiao Y, Hyde KD (2018) Phylogenetic placement of *Akanthomyces muscarius*, a new endophyte record from *Nypa fruticans* in Thailand. Curr Res Environ Appl Mycol J. 8(3):404–17.

Vittal BP, Sarma VV (2007) Diversity and ecology of fungi on mangroves of Bay of Bengal region–An overview. Indian Journal of Marine Sciences 35:308–317.

White TJ, Bruns T, Lee SJ, Taylor J (1990) Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. PCR protocols: a guide to methods and applications. 18(1):315–22.

Wiehe PO (1949) Wilt of Calophyllum inophyllum L. var. tacamaha (Willd.) R.E.V. caused by *Haplographium calophylli* sp.nov. in Mauritius. Mycological Papers 29:1–11.

Wijayawardene NN, Hyde KD, Lumbsch HT, Liu JK, Maharachchikumbura SS, Ekanayaka AH, Tian Q, Phookamsak R (2017) Outline of ascomycota. Fungal Diversity 88(1):167–263.

Zhang SN, Hyde KD, Jones EG, Jeewon R, Cheewangkoon R, Liu JK (2019) Striatiguttulaceae, a new pleosporalean family to accommodate Longicorpus and Striatiguttula gen. nov. from palms. MycoKeys. 49:99.

Zhou S, Stanosz GR (2001) Relationships among Botryosphaeria species and associated anamorphic fungi inferred from the analyses of ITS and 5.8 S rDNA sequences. Mycologia 93(3):516–27.

Tables

Table 1 List of Pleosporalean taxa used in this study along with their GenBank Accession numbers. New sequences are given in bold typeface. *T* stands for the Type species of each genus.

Taxa	Strain/Culture	GenBank Accession numbers		
		LSU	SSU	TEF
Acrocordiopsis patilii	BCC28167	GU479773	GU479737	–
*Acrocordiopsis patilii*T	BCC28166	GU479772	GU479736	–
Acuminatispora palmarum	MFLUCC 18-0460	MH390438	MH390402	MH399249
*Acuminatispora palmarum*T	MFLUCC 18-0264	MH390437	MH390401	MH399248
*Aigialus grandis*T	BCC18419	GU479774	GU479738	GU479838
Aigialus mangrovei	BCC33563	GU479776	GU479741	GU479840
Aigialus parvus	BCC 18403	GU479778	GU479744	GU479842
Aigialus rhizophorae	BCC 33572	GU479780	GU479745	GU479844
Alternaria alternata	CBS 916.96	DQ678082	DQ678031	DQ677927
*Amniculicola lignicola*T	Ying01	EF493861	EF493863	–
*Anteaglonium abbreviatum*T	ANM 925a	GQ221877	–	GQ221924
Anteaglonium globosum	ANM 925.2	GQ221879	–	GQ221925
*Antealophiotrema brunneosporum*T	CBS 123095	LC194340	–	LC194382
Aquasubmersa japonica	KT 2862	LC061587	LC061582	–
*Aquasubmersa mircensis*T	MFLUCC 11-0401	JX276955	JX276956	–
Arthonia dispersa	UPSC2583	AY571381	AY571379	–
*Ascocratera manglicola*T	BCC 09270	GU479782	GU479747	GU479846
*Astrosphaeriella fusispora*T	MFLUCC 10-0555	KT955462	–	–
Astrosphaeriella neofusispora	MFLUCC 11-0161	KT955463	KT955444	–
Astrosphaeriella stellata	KT998	AB524592	AB524451	–
Astrosphaeriellopsis bakeriana	MFLUCC 11-0027	JN846730	–	–
*Astrosphaeriellopsis bakeriana*T	CBS 115556	GU301801	–	GU349015
*Bimuria novae-zelandiae*T	CBS 107.79	AY016356	AY016338	DQ471087
Botryosphaeria dothidea	CMW 8000	KF766319	KF766233	–
*Byssothecium circinans*T	CBS 675.92	AY016357	–	GU349061
Capnodium coffeae	CBS 147.52	DQ247800	DQ247808	DQ471089
Caryospora minima	–	EU196550	EU196551	–
Caryospora aquatica	MFLUCC 11-0008	MH057847	MH057850	–
Cladosporium herbarum	CBS 399.80	DQ678074	DQ678022	DQ677918
Cryptocoryneum condensatum	CBS 122629	LC194351	LC194309	LC096139
Cryptocoryneum pseudorilstonei	CBS 113641	LC194364	LC194322	LC096152
Delitschia chaetomioides	SMH 3253.2	GU390656	–	–
Delitschia didyma	UME 31411	DQ384090	AF242264	–
Delitschia winteri	CBS 225.62	DQ678077	–	–

Dendrographa decolorans	Ertz 5003 (BR)	NG_027622	AY548809	–
*Didymella exigua*T	CBS 183.55	EU754155	EU754056	–
Didymosphaeria rubi-ulmifolii	MFLUCC 14-0023	KJ436586	KJ436588	–
Dissoconium aciculare	CBS 204.89	GU214419	GU214523	–
Dothidotthia aspera	CPC 12933	EU673276	EU673228	–
*Dothidotthia symphoricarpi*T	CPC 12929	EU673273	EU673224	–
Extremus antarcticus	CCFEE 5312	KF310020	–	–
Fissuroma bambusae	MFLUCC 11-0160	KT955468	KT955448	KT955430
*Halotthia posidoniae*T	BBH 22481	GU479786	–	–
Hermatomyces iriomotensis	MAFF 245730	LC194367	–	LC194394
Hypsostroma caimitalense	GKM 1165	GU385180	–	–
*Hypsostroma saxicola*T	SMH 5005	GU385181	–	–
Hysterium angustatum	CBS 236.34	FJ161180	GU397359	FJ161096
Hysterobrevium smilacis	CBS 114601	FJ161174	FJ161135	FJ161091
*Latorua caligans*T	CBS 576.65	KR873266	–	–
Latorua grootfonteinensis	CBS 369.72	KR873267	–	–
Lecanactis abietina	Ertz 5068 (BR)	AY548812	AY548805	–
*Longicorpus striataspora*T	MFLUCC 18-0267	MK035988	MK035973	MK034428
Longicorpus striataspora	MFLUCC 18-0268	MK035989	MK035974	MK034429
Longicorpus striataspora	MFLUCC 17-2515	MK035990	MK035975	MK034430
Longicorpus striataspora	MFLUCC 17-2516	MK035991	MK035976	MK034431
Lepidosphaeria nicotiae	CBS 101341	DQ678067	–	–
*Leptosphaeria doliolum*T	CBS 505.75	GU301827	GU296159	GU349069
Leptoxyphium fumago	CBS 123.26	GU301831	GU214535	GU349051
Ligninsphaeria jonesii	GZCC 15-0080	KU221038	–	–
*Ligninsphaeria jonesii*T	MFLUCC 15-0641	KU221037	–	–
Lindgomyces cinctosporae	R56-1	AB522431	AB522430	–
*Lindgomyces ingoldianus*T	ATCC 200398	AB521736	AB521719	–
Lindgomyces rotundatus	KT1096	AB521740	AB521723	–
Lophiostoma macrostomoides	GKM1033	GU385190	–	–
Lophiotrema boreale	CBS 114422	LC194375	–	LC194402
Lophiotrema lignicola	CBS 122364	GU301836	GU296166	GU349072
*Lophiotrema nucula*T	CBS 627.86	GU301837	GU296167	GU349073
*Macrodiplodiopsis desmazieri*T	CPC 24971	KR873272	–	–
Massaria anomia	CBS 591.78	GU301839	GU296169	–
Massaria gigantispora	M26	HQ599397	HQ599447	HQ599337

Massaria inquinansT	M19	HQ599402	HQ599444	HQ599342
Massarina eburneaT	CBS 473.64	GU301840	GU296170	GU349040
Mauritiana rhizophoraeT	BCC 28866	GU371824	–	GU371817
Melanomma pulvis-pyriusT	CBS 124080	GU456323	GU456302	GU456265
Murispora rubicundaT	IFRD 2017	FJ795507	GU456308	–
Mycosphaerella graminicola	CBS 292.38	DQ678084	DQ678033	–
Neoastrosphaeriella krabiensisT	MFLUCC 11-0025	JN846729	JN846739	–
Neodeightonia palmicola	MFLUCC10-0822	HQ199222	HQ199223	–
Neotestudina rosatii	CBS 690.82	DQ384107	DQ384069	–
Nigrograna mackinnoniiT	CBS 674.75	GQ387613	–	–
Nigrograna marina	CY 1228	GQ925848	–	–
Phaeosphaeria oryzaeT	CBS 110110	GQ387591	GQ387530	–
Phoma herbarumT	CBS 276.37	DQ678066	DQ678014	DQ677909
Piedraia hortae var. hortae	CBS 480.64	GU214466	AY016349	–
Pleomassaria sipariaT	CBS 279.74	DQ678078	DQ678027	–
Pleospora herbarumT	CBS 191.86	DQ247804	DQ247812	DQ471090
Polyplosphaeria fuscaT	KT 1616	AB524604	AB524463	–
Preussia funiculataT	CBS 659.74	GU301864	–	–
Prosthemium orientale	KT1669	AB553748	AB553641	–
Pseudoastrosphaeriella africana	MFLUCC 11-0176	KT955474	KT955454	KT955436
Pseudoastrosphaeriella bambusae	MFLUCC 11-0205	KT955475	–	KT955437
Pseudoastrosphaeriella longicolla	MFLUCC 11-0171	KT955476	–	KT955438
Pseudoastrosphaeriella thailandensisT	MFLUCC 11-0144	KT955478	KT955457	KT955440
Pseudotetraploa curviappendiculataT	HC 4930	AB524608	AB524467	–
Quadricrura septentrionalisT	HC 4984	AB524616	AB524475	–
Racodium rupestre	L346	EU048583	EU048575	–
Roccella fuciformis	Tehler 8171	FJ638979	–	–
Roussoella nitidulaT	MFLUCC 11-0182	KJ474843	–	KJ474852
Roussoellopsis macrospora	MFLUCC 12-0005	KJ474847	–	KJ474855
Salsuginea ramicola	KT2597.2	GU479801	GU479768	GU479862
Salsuginea ramicolaT	KT 2597.1	GU479800	GU479767	GU479861
Striatiguttula phoenicis	**MFLUCC 20-0093**	**MT587580**	**MT587572**	**MT597402**
Striatiguttula phoenicis	**MFLUCC 20-0094**	**MT587573**	**MT587571**	**MT597403**
Striatiguttula nypaeT	MFLUCC 18-0265	MK035992	MK035977	MK034432
Striatiguttula nypae	MFLUCC 17-2517	MK035993	MK035978	MK034433

Striatiguttula nypae	MFLUCC 17-2518	MK035994	MK035979	MK034434
Striatiguttula phoenicisT	MFLUCC 18-0266	MK035995	MK035980	MK034435
Tetraplosphaeria sasicolaT	KT563	AB524631	AB524490	–
Trematosphaeria pertusaT	CBS 122371	FJ201992	–	–
Triplosphaeria maximaT	KT 870	AB524637	AB524496	–
Ulospora bilgramiiT	CBS 101364	DQ678076	DQ678025	DQ677921
Verruculina enaliaT	BCC 18401	GU479802	–	GU479863
Wicklowia aquatica	AF289-1	GU045446	–	–
Wicklowia aquaticaT	F76-2	GU045445	GU266232	–
Zopfia rhizophilaT	CBS 207.26	DQ384104	–	–

Abbreviations: **ATCC**: American Type Culture Collection, Virginia, USA; **BBH**: Biotec Bangkok Herbarium, Thai-land; **BCC**: BIOTEC Culture Collection, Bangkok, Thailand; **CBS**: Central bureauvoor Schimmel cultures, Utrecht, The Netherlands; **CPC**: Collection of Pedro Crous house dat CBS; **DAOM**: Plant Research Institute, Department of Agriculture (Mycology), Ottawa, Canada; **GZCC**: Guizhou Culture Collection; **IFRDCC**: Culture Collection, International Fungal Research **and** Development Centre, Chinese Academy of Forestry, Kunming, China; **JCM**: the Japan Collection of Microorganisms, Japan; **MAFF**: Ministry of Agriculture, Forestry and Fisheries, Japan; **MFLU**: Mae Fah Luang University Herbarium Collection; **MFLUCC**: Mae Fah Luang University Culture Collection, Chiang Rai, Thailand. **ANM**: A.N. Miller; **GKM**: G.K. Mugambi; **JK**: J. Kohlmeyer; **KT**: K. Tanaka; **SMH**: S.M. Huhndorf

Table 2 List of *Rhytidhysteron* (Hysteriales) taxa used in this study along with their GenBank Accession numbers. The new sequence in **bold.** *T* represents Type species of the genus.

		GenBank Accession numbers			
Taxa	**Strain/Culture**	**LSU**	**SSU**	***tef1***	**ITS**
Gloniopsis praelonga	CBS 112415	FJ161173	FJ161134	FJ161090	-
Rhytidhysteron bruguierae T	MFLUCC 18-0398	MN017833	MN017901	MN077056	-
Rhytidhysteron chromolaenae	MFLUCC 17-1516	MN632456	MN632467	MN635663	MN632461
Rhytidhysteron hysterinum	EB 0351	GU397350	-	GU397340	-
Rhytidhysteron kirshnacephalus	**MFLUCC 18-1111**	**MT612351**	**-**	**MT674994**	**MT712758**
Rhytidhysteron magnoliae T	MFLUCC 18-0719	MN989384	MN989382	MN997309	MN989383
Rhytidhysteron mangrovei T	MFLUCC 18-1113	MK357777	-	MK450030	NR_165548
Rhytidhysteron neorufulum T	MFLUCC 13-0216	KU377566	KU377571	KU510400	KU377561
Rhytidhysteron neorufulum	GKM 361A	GQ221893	GU296192	GU349031	-
Rhytidhysteron neorufulum	HUEFS 192194	KF914915	-	-	-
Rhytidhysteron neorufulum	CBS 306.38	FJ469672	AF164375	GU349031	-
Rhytidhysteron neorufulum	MFLUCC 12-0567	KJ526126	KJ546129	-	KJ546124
Rhytidhysteron neorufulum	MFLUCC 12-0569	KJ526128	KJ546131	-	KJ546126
Rhytidhysteron neorufulum	EB 0381	GU397351	GU397366	-	-
Rhytidhysteron opuntiae	GKM 1190	GQ221892	-	GU397341	-
Rhytidhysteron rufulum T	MFLUCC 14-0577	KU377565	KU377570	KU510399	KU377560
Rhytidhysteron rufulum	EB 0384	GU397354	GU397368	-	-
Rhytidhysteron rufulum	EB 0382	GU397352	-	-	-
Rhytidhysteron rufulum	EB 0383	GU397353	GU397367	-	-
Rhytidhysteron rufulum	MFLUCC 12-0013	KJ418111	KJ418113	-	KJ418112
Rhytidhysteron thailandicum T	MFLUCC 14-0503	KU377564	KU377569	KU497490	KU377559
Rhytidhysteron thailandicum	MFLUCC 12-0530	KJ526125	KJ546128	-	KJ546123
Rhytidhysteron tectonae T	MFLUCC 13-0710	KU764698	KU712457	KU872760	KU144936

Abbreviations: **GKM**: G.K. Mugambi, **EB**: E.W.A. Boehm, **MFLUCC**: Mae Fah Luang University Culture Collection, **CBS**: Central bureau voor Schimmelcultures

Table 3 Morphological comparison between species of *Striatiguttula*

Taxa		Ascomata		Hamathecium, Pseudopar-aphyses (μm)	Asci (μm)		Ascospores	
	Ascomata morphology	(high × diam. μm)	Peridium (μm)			Ascospores morphology	Ascospores size (μm)	References
Striatiguttula phoenicis **(**MFLU 19-2847)	**Immersed, erumpent, ampulliform, subglobose or conical**	**250–380 × 195–310**	**30–90**	**Purple, 1.75–2.5**	**64–128 × 9–13.8**	**oval, ellipsoidal to fusiform 0–3-septate**	**13–32 × 6.4–8**	**This study**
Striatiguttula nypae	Immersed and erumpent to superficial, subglobose or conical, uni-loculate or bi-loculate,	240–380 × 195–385	9–16	Hyaline, 1–2	64–145 × 8–17	Fusiform, 1–3-septate	18–26 × 4–6	Zhang et al. 2019
Striatiguttula phoenicis	Immersed, erumpent, ampulliform, subglobose, uni loculate	195–580 × 135–390	10–24	Hyaline, 1–2	89–141 × 12–18	Fusiform to ellipsoidal, 1–3-septate, nearly concolorous	20–29 × 6–10	Zhang et al. 2019

Table 4 Morphological comparison between of *Rhytidhysteron*

***Rhytidhysteron* Taxa**				**Asci (number of spores)**	**Ascospores (µm)**	**References**
	Ascoma margins	**(high × diam. µm)**	**Pruina**			
Rhytidhysteron brasiliense	Rough-without striations	1087–1715 × 340–447		8	1–3-septate, 40–45 × 12–20	Thambugala et al. 2016
Rh. bruguierae	Rough-Striate	400–950 × 548–570	Dark brown	6–8	1–3-septate, 14–26 × 6.2–9	Dayarathne et al. 2020
Rh. columbiense	Striate	1500–3000 × 1200–1800		6–8	38–52 × 13–18	Soto-Medina and Lucking 2018
Rh. hysterinum	Smooth-Striate	1000–3000 × 500		4–8	1-septate, 20–32 × 12–15	Samuels and Müller 1980
Rh. magnoliae	Distinct striation	1200–2300 × 540– 600	Dark brown	8	1–3-septate, (25–32 × 8–12) µm	De Silva et al. 2020
Rh. mangrovei	Rough-Striate	930–1980 × 785–910	Brick-red	2– (–6) –8	1–3-septate, 21–28 × 7.5–8.5	Kumar et al. 2019
Rh. neorufulum	Rough-without striations	835–1800 × 600–1320		8	1–3-septate, 27–34 × 6.5–12.5	Thambugala et al. 2016
Rh. rufulum	Striate	900–2350 × 1134–1450		8	1–3-septate, 21–36 × 9–13	Thambugala et al. 2016
Rh. tectonae	Striate	1225–3365 × 370–835		8	1-septate, 19–31 × 8–13	Doilom et al. 2017
Rh. kirshnacephalus	**Smooth-without striations**	**1200–1800 × 480–750**	**Black**	**4–6**	**1–3-septate, 16.5–22 × 6.0–7.5 µm**	**This study**
Rh. thailandicum	Rough-without striations	700–1200 × 530–750		(3–)6–8	3-septate, 20–31 × 7.5–12	Thambugala et al. 2016

Table 5 List of *Lasiodiplodia* (Botryosphaeriales) taxa used in this study along with their GenBank Accession numbers. The new sequence in **bold**

Taxa	Strain/Culture	GenBank Accession numbers	
		ITS	TEF
Lasiodiplodia avicenniae	CMW 41467	KP860835	KP860680
L. avicenniarum	MFLUCC 17-2591	NR_163344	MK340867
L. brasiliensis	CMM4015	JX464063	JX464049
L. bruguierae	CMW42480	KP860832	KP860677
L. caatinguensis	IBL366	KT154760	KT008006
L. chinensis	CGMCC 3.18061	KX499889	KX499927
L. citricola	IRAN1522C	GU945354	GU945340
L. citricola	**MFLUCC 18-1115**	**MK106111**	**-**
L. crassispora	WAC12533	DQ103550	DQ103557
L. euphorbicola	CMM3609	KF234543	KF226689
L. exigua	BL104	KJ638317	KJ638336
L. gilanensis	IRAN1523C	GU945351	GU945342
L. gonubiensis	CMW14077	AY639595	DQ103566
L. gravistriata	CMM4564	KT250949	KT250950
L. hormozganensis	IRAN1500C	NR_147329	GU945343
L. hyalina	CGMCC 3.17975	NR_152982	KX499917
L. iraniensis	IRAN921C	GU945346	GU945334
L. laeliocattleyae	CBS 167.28	NR_147364	KU507454
L. lignicola	MFLUCC 11-0435	NR_111795	JX646862
L. macrospora	CMM3833	NR_147349	KF226718
L. mahajangana	CMW 27801	FJ900595	FJ900641
L. margaritacea	CBS 122519	NR_136998	EU144065
L. mediterranea	BL1	KJ638312	KJ638331
L. missouriana	UCD2193MO	HQ288226	HQ28826
L. parva	CBS 456.78	NR_111265	EF622063
L. plurivora	STEU 5803	EF445362	EF445395
L. pontae	IBL12	KT151794	KT15179
L. pseudotheobromae	CBS116459	NR_111264	EF622057
L. pyriformis	CBS 121770	NR_136993	EU101352
L. rubropurpurea	WAC12535	DQ103553	DQ103571
L. sterculiae	CBS 342.78	NR_147365	KX464634
L. subglobosa	CMM3872	NR_147350	KF226721
L. thailandica	CPC:22755	KM006433	KM006464
L. theobroame	CBS 164.96	NR_111174	AY640258

L. venezuelensis	WAC 12539	NR_136975	DQ103568
L. viticola	UCD 2553AR	HQ288227	HQ288269
L. vitis	CBS 124060	KX464148	KX464642
L. cinnamomi	CFCC 51997	MG866028	MH236799
L. chonburiensis	MFLUCC 16-0376	MH275066	MH412773
L. pandanicola	MFLUCC 16-0265	MH275068	MH412774
L. swieteniae	MFLUCC 18-0244	MK347789	MK340870
Barriopsis iraniana	IRAN1448C	NR_137030	FJ919652
B. tectonae	CMW40687	NR_137616	KJ556517

Abbreviations: **CMW**: FABI fungal culture collection, **IBL**: Botanical Institute, Lisbon Faculty of Sciences, Lisbon, Portugal, **CGMCC**: China General Microbiological Culture Collection Center, **IRAN**: Iranian Fungal Culture Collection, **WAC**: Department of Agriculture and Food Western Australia Plant Pathology Collection, **BL**: B.T. Linaldeddu, **UCD**: Phaff Yeast Culture Collection, Department of Food Science and Technology, University of California, Davis, **CPC**: Collection of Pedro Crous housed at CBS, **CFCC**: China Forestry Culture Collection Center, **CBS**: Centraal bureau voor Schimmel cultures, **MFLUCC**: Mae Fah Luang University Culture Collection, **STEU**: University of Stellenbosch fungal culture collection

Table 6 List of fungi occurring on the aerial parts of mangrove trees with their different mode of nutrition.

Name	Host	Locality	Reference
Acidiella uranophila	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Acremonium alternatum	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Akanthomyces muscarius	Leaves of *Nypa fruticans*	Thailand	Kumar et al. 2018
Alternaria alternata	Phylloplane of *Avicennia marina*, Leaves of *Acanthus ilicifolius, Acanthus ihcifolius, Arthrocnemum indicum, Lummtzera racemosa, Rhizophora apiculata*	India, Taiwan	Wei-Chiung Chi et al. 2019, Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998, Nayak and Anandhu 2017
Ampullifera sp.	-	India	Suryanarayanan and Kumaresna 2000
Anthostomella eructans	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Anthostomella sp.	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Apiognomonia catappae	Leaves of *Terminalia catappa*	Indonesia	Koorders 1907
Apiognomonia terminaliae	Leaves of *Terminalia catappa*	Japan	Katumoto and Harada 1979
Ascochytella rhizophoropsis	Living leaves of *Rhizophora sp.*	Dominican Republic	Gonzalez Fragoso and Ciferri 1926
Ascochytella thespesiae	Leaves of *Thespesia populnea*	Dominican Republic	Gonzalez Fragoso and
Ascotricha chartarum	Leaves of *Acrostichum aureum*, *Rhizophora mucronata*	India	Ananda and Sridhar 2002, Maria and Sridhar 2003
Aspergillus awamori	Phylloplane of *Avicennia marina*	India	Nayak and Anandhu 2017
Aspergillus candidus	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Aspergillus flavus	Leaves of *Acanthus ilicifolius, Avicennia germinans, Avicennia marina, Rhizophora apiculata, Rhizophora mucronata*	Texas (USA), India, Mexico, Malaysia	Chowdhery and Rai 1980, Koehn and Garrison 1981, Kuthubutheen 1984, Rai et al. 1969, Nayak and Anandhu 2017
Aspergillus fumigatus	Living leaves of *Avicennia germinans*	India, Japan, Hawaii, Malaysia, Pakistan	Chowdhery and Rai 1980, Ito and Nakagiri 1997, Kuthubutheen 1984, Lee and Baker 1972, Rai et al. 1969, Tariq et al. 2006, Thorati et al. 2016
Aspergillus glaucus	Leaves of *Rhizophora mucronata*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998
Aspergillus nidulans	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Aspergillus niger	Leaves of *Avicennia marina, Ceriops decandra, Excoecana agallocha, Rhizophora mucronata*	India, Pakistan, Texas (USA), India, Hawaii, Japan, Mexico, Singapore, Malaysia	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al. 1998, Tariq et al. 2006, Nayak and Anandhu 2017, Chowdhery and Rai 1980, Ito and Nakagiri 1997, Koehn and Garrison 1981, Kuthubutheen 1984, Newell, Steven Y. 1976. Newell 1973
Aspergillus ochraceus	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017

Aspergillus parasiticus	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Aspergillus sp.	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Aspergillus sulphureus	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Aspergillus terreus	Leaves and Stems of *Avicennia marina*	Texas (USA), India, Mexico, Japan, Florida (USA), Malaysia	Chowdhery and Rai 1980, , Ito and Nakagiri 1997, Koehn and Garrison 1981, Kuthubutheen 1984, Nayak and Anandhu 2017 Newell 1976
Aspergillus versicolar	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Aspergillus wentii	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
*Asteridiella laguncularia*e	Living leaves of *Laguricularia racemosa*	Porto Rico	Earle 1901
Asteridiella nigra	Living leaves of *Laguricularia racemosa*	Porto Rico	Stevens 1916
Asteridiella pavoniae	On *Pavonia spicata*	Dominican Republic	Ciferri 1954
Asteridiella sepulta	Leaves of *Avicennia sp.*		Patouillard 1916
Asterina ciferriana	Living leaves of *Caesalpinia crista*	Dominican Republic	Petrak and Cifferi 1932
Asterina derridis	Leaves of *Derris trifoliata*	Kenya and Madagascar	Hennings 1908
Aureobasidium pullulans	Living leaves and seedlings of *Avicennia germinans, Avicennia marina, Rhziophora mangle*	Mexico, Venezuela, Malaysia, Florida (USA), India, Japan, Hawaii, Taiwan	, Kohlmeyer and Kohlmeyer 1979, Kuthubutheen 1981, Kuthubutheen 1984, Meyers et al. 1965, Newell 1976, Newell 1973, Newell and Fell 1980, Wei-Chiung Chi et al. 2019
Barriopsis fusca	On *Hibiscus tiliaceus*	-	Stevens 1926
Bipolaris victoriae	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Botryodiplodia thespesiae	Dead branch of *Thespesia populnea*	Dominican Republic	Petrak and Cifferi 1930
Botryosphaeria dothidea	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Botryosphaeria quercuum	Leaves of *Laguricularia racemosa*	Brazil	Rehm 1901
Botrytis argillacea	Bark of *Avicennia eucalyptifolia*	Austrailia	McAlpine 1897
Camarosporium palliatum	Leaves of *Arthrocnemum indicum, Suaeda maritima, Aerial leaves and seedlings of Thalassium testinudum*, *Ceriopsis tagal, Rhizophora magle*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al. 1998, Borse et al. 1988, Kohlmeyer and Kohlmeyer 1979, Suryanarayanan and Kumaresna 2000
Capnobotrys hibisci	Leaves of *Hibiscus tiliaceus*	Cuba	Mercado 1984
Cercospora geraisensis	Leaves of *Terminalia catappa*	Brazil	Chupp 1954
Cercospora rhizoyhorae	Leaves of *Rhizophora mangle*	Florida, USA	Creager 1962

Cercosporella thespesiae	Endophyte of *Arthrocnemum indicum*, On *Thespesia populnea*	India	Poonyth et al. 2000
Chaetomium globosum	Leaves of *Avicennia marina, Rhizophora apiculata, Rhizophora mucronata, Thespeisa populnea*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998, Kuthubutheen 1981, Poon and Hyde 1998, Suryanarayanan et al. 1998, Guerrero et al. 2018
Cladosporium cladosporioides	Leaves of *Avicennia marina, Avicennia officinalis, Ceriops decandra, Lumnitzera racemosa, Rhizophora apiculata, Rhizophora mucronata*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998, Tariq et al. 2006
Cladosporium dominicanum	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Cladosporium marinum	Endophyte, living leaves of *Rhizophora apiculata, Rhizophora mucronata, Phragmities australis, Avicennia marina*	India, Hong Kong	Poonyth et al. 2000.
Cladosporium oxysporum	Roots of *Avicennia officinalis, Rhizophora mucronata*	India	Ananda and Sridhar 2002
Cladosporium psoraleae	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Colletotrichum boninense	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Colletotrichum gloeosporioides	Leaves of *Avicennia schaueriana, Lumnitzera racemosa, Rhizophora mangle, Bruguiera cylindrica*	Brazil, India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998, Costa et al. 2012
Colletotrichum gloeosporioides	Leaves of *Avicennia schaueriana, Lumnitzera racemosa, Rhizophora mangle*	Brazil	Costa et al. 2012
Colletotrichum hippeastri	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Colletotrichum sp.	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Corynespora cassiicola	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Coryneum calophylli	On *Calophyllum inophyllum*	Philippines	Sydow and Sydow 1914
Crepidotus krieglsteineri	Dead wood of *Rhizophora mangle*	Florida, USA	Singer 1988
Crustoderma vulcanense	Dead Plant	Hawaii	Gilbertson and Adaskaveg 1993
Curvularia australiensis	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Curvularia lunata	Leaves of *Avicennia officinalis, A. marina, Lumnitzera racemosa, Rhizophora apiculata*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998, Nayak and Anandhu 2017, Hamzah et al. 2018
Curvularia pallescens	Leaves of *Avicennia marina, Lumnitzera racemosa*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al. 1998

Cyphellophora sp.	Stem canker of *Avicennia marina*	South Africa	Osorio et al. 2017
Cytospora lumnitzericola	leaf spot of *Lumnitzera racemosa*	Thailand	Norphanphoun et al. 2018
Cytospora pinastri	Roots of *Sonneratia caseolans*	India	Ananda and Sridhar 2002
Dacrymyces intermedius	Dead twig of *Hibiscus tiliaceus*	Tahiti	Olive 1958
Dactylaria purpurella	Roots of *Acanthus ihcifolius*	India	Ananda and Sridhar 2002
Daldinia eschscholtzii	Leaves of *Acanthus ilicifolius var. xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Diaporthe endophytica	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Diaporthe hongkongensis	Leaves of *Nypa fruticans*	India	Rajamani et al. 2018
Diaporthe perseae	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Dictyochaeta tumidoseta	Dead raches of *Oncosperma tigillarium*	Malaysia	Kuthubutheen and Nawawi 1991
Diplodfa Catappae	Nuts of *Terminalia catappa*	India	Cooke 1876
Diplodia inocarpi	Cortex of rotting fuite (*Inocarpus fagifer*)	Singapore	Saccardo 1918
Dothioraceae sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Dothiorella calophylli	Living leaves and endophyte of *Aegicera conriculatum, Rhizophora mucronata*, On *Calophyllum inophyllum*	India	Poonyth et al. 2000
Dothiorella indica	Pods of *Pongamia pinnata*	India	Soni et al. 1983
Drechslera sp.	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Dwibeeja sundara	Bark of *Calophyllum*	Singapore	Subramanian 1992
Ellisembia crassispora	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Elsinoe terminaliae	On *Terminalia catappa*	Brazil	Bitancourt 1937
Endothiella coccolobae		Bermuda	Roane 1986
Eudimeriolum avicenniae	Leaves of *Avicennia sp.*	Tanzania	Hansford 1946
Eutypella pongamiae	Dry twigs of *Pongamia pinnata*	India	Agarwal and Gypli
Eutypella sp.	Branch canker of *Avicennia marina*	South Africa	Osorio et al. 2017
Exserohilum rostratum	Living leaves of *Avicennia marina, Lumnitzera racemosa*	Malaysia, Singapore, Florida (USA), India, USA	Kohlmeyer and Kohlmeyer 1979, Kuthubutheen 1981, Kuthubutheen 1984, Leong et al. 1988, Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al. 1998
Fasciatispora petrakii	Rachid of *Nypa fruticans*	Malaysia	Hyde and Alias 1999
Fomes avicenniae	Trunk of *Avicennia marina*	Somalia	Poonyth et al. 2000
Fusariella obstipa	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Fusarium	Roots of *Acanthus ihcifolius*	India	Ananda and Sridhar 2002

chlamydosporum			
Fusarium oxysporum	Roots of *Acanthus ihcifolius, Avicennia officinalis, Rhizophora mucronata*	India	Ananda and Sridhar 2002
Fusarium sp.	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Fusicoccum microsporum	Leaves of *Terminalia catappa*	Dominican Republic	Hariot and Karsten 1890
Ganoderma pulverulentum	Dry trunk of *Hippomane mancinellae*	Grenada	Murrill 1908
Gloeosporium barringtoniae	Leaves of *Barringtonia asiaticae*	Hawaii	Poonyth et al. 2000
Gloeosporium hibisci-tiliacei	Living leaves of *Hibiscus tiliaceus*	Republic of Formosa	Sawada 1931
Gloeosporium inocarpi	Fruits of *Inocarpus fagifer*	Singapore	Saccardo 1918
Gloeosporium terminaliae	Leaves of *Terminalia catappa*	Burma	Sydow and Butler 1916
Glomerella sp.	Living leaves of *Avicennia marina*	Hong Kong, India	Poonyth et al. 2000, Suryanarayanan et al. 1998, Nayak and Anandhu 2017
Gnomoniella hibisci	On *Hibiscus tiliaceus*	Taiwan	Sawada 1942
Guignardia sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*, *Lumnitzera racemosa, Rhizophora mangle*	Brazil, Taiwan	Costa et al. 2012, Wei-Chiung Chi et al. 2019
Hansfordia pulvinata	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Haplosporella thespesiae	Leaves of *Thespesia populnea*	Dominican Republic	Poonyth et al. 2000
Harknessia terminaliae	Leaves of *Terminalia catappa*	Taiwan	Sawada 1959
Helminthosporium glabroides	On *Laguricularia racemosa*		Seymour 1929
Helminthosporium subsimile	Living and dead leaves of *Bruguiero hoinesii*	Singapore	Saccardo 1918
Helotium inocarpi	Leaves of *Inocarpus fagifer*	New Guinea	Hennings xxxx
Hemidothis pellitiformis	Leaves of *Thespesia populnea*	Dominican Republic	Poonyth et al. 2000
Hendersonia sp.	Leaves of *Terminalia catappa*	Philippines	Petrak 1928
Heterosporium terrestre	Roots of *Rhizophora mucronata, Sonneratia caseolans*	India	Ananda and Sridhar 2002
Hortaea werneckii	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Humicola alopallonella	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Hydea pygmea	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Hyphoderma scaevolae	On *Scaevola taccada*	Reunion	Boidin and Gilles 1991
Hyphodontia aloha	Dead branches of *Hibiscus tiliaceus*	Hawaii	Gilbertson and Adaskaveg 1993
Inonotus cremeicinctus	Trunk of *Avicennia sp.*	Singapore	Corner 1991
Irenopsis coronata	Leaves on *Hibiscus tiliaceus*	Puerto Rico	Stevens 1916
Irenopsis moelleriana	Leaves of *Hibiscus tiliaceus*	Puerto Rico	Hansford 1957

Kyphophora avicenniae	Leaves of *Avicennia marina*	Austrailia	Sutton 1991
Lasiodiplodia citricola	Dead branches of standing *Rhizophora apiculata*	Thailand	This study
Lasiodiplodia sp.	Branch die-back of *Avicennia marina*	South Africa	Osorio et al. 2017
Lasiodiplodia theobromae	On *Hibiscus tiliaceus*	-	Pole-Evans 1905
Leptothyrium rhizophorae	Leaves of *Rhizophora mangle*	Dominican Republic	Gonzalez Fragoso and Ciferri 1928
Lichtheimia corymbifera	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Linocarpon angustatum	Petioles of *Nypa fruticans*	Malaysia	Hyde and Alias 1999
Linocarpon appendiculatum	Fronds of *Nypa fruticans*	Brunei	Hyde 1988, 1992
Linocarpon livistonae	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Linocarpon nipae	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Mapea radiata	Fruits of *Inocarpus fagifer*	French Polynesia	Patouillard 1906
Meliola ceriopis	Living leaves of *Ceriojas tagal*	Brunei	Poonyth 2000
Meliola cylindrophora	Living leaves of *Caesalpinia crista*	Philippines	Rehm 1913
Meliola elodea	Leaves of *Ceriojas tagal*	Brunei	Sydow. 1928
Meliola hippomaneae	Living leaves of *Hippomane mancinellae*	Panama	Stevens 1928
Meliola procera	On *Hibiscus tiliaceus*	Dominican Republic	Poonyth et al. 2000
Micropeltis laguncularіae	Leaves of *Laguricularia racemosa*		Seymour 1929
Mollisia petiolorum	On *Hibiscus tiliaceus*	Hawaii	Cash 1938
Mycosphaerella devia	Living leaves of *Dalbergia ecastophylla*	Dominican Republic	Poonyth et al. 2000
Mycosphaerella pongamiae	Leaves of *Pongamia pinnata*	Indonesia, Taiwan	Raciborski 1900
Mycosphaerella sp.	Leaf galls of *Avicennia marina*	South Africa	Osorio et al. 2017
Myxotrichum chartarum	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Neocosmospora solani	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Neodevriesia capensis	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Neofusicoccum ribis	On *Hibiscus tiliaceus, Laguricularia racemosa*	-	Shear et al. 1924, Seymour 1929
Neolinocarpon globosicarpum	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Neolinocarpon nypicola	Rachid of *Nypa fruticans*	Malaysia	Hyde and Alias 1999

Neopestalotiopsis acrostichi	leaf spots of *Acrostichum aureum*	Thailand	Norphanphoun et al. 2019
Neopestalotiopsis alpapicalis	Leaves of *Nypa fruticans*	Thailand	Kumar et al. 2019a
Neopestalotiopsis brachiata	leaf spots of *Rhizophora apiculata*	Thailand	Norphanphoun et al. 2019
Neopestalotiopsis petila	leaf spots of *Rhizophora mucronata*	Thailand	Norphanphoun et al. 2019
Neopestalotiopsis rhizophorae	leaf spots of *Rhizophora mucronata*	Thailand	Norphanphoun et al. 2019
Neopestalotiopsis sonneratae	leaf spots of *Sonneratia alba*	Thailand	Norphanphoun et al. 2019
Neopestalotiopsis thailandica	leaf spots of *Rhizophora mucronata*	Thailand	Norphanphoun et al. 2019
Nigrospora oryzae	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Nigrospora oryzae	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Nodulisporium sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Ophiostoma ulmi	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Oxydothis nypae	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Pachytrype graphidioides	Dead wood of *Terminalia catappa*	Philippines	Sydow and Sydow 1914
Paecilomyces variotii	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Passalora pongamiicola	On *Pongamia pinnata*	India	Kar and Mandal 1969
Passalora pongamiicola	On *Calophyllum inophyllum*	India	Poonyth et al. 2000
Patellaria atrata	On *Hibiscus tiliaceus*	-	Cash 1938
Penicillium chrysogenum	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Penicillium citrinum	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Penicillium dierckxii	Phylloplane of *Avicennia marina*	India	Nayak and Anandhu 2017
Penicillium digitatum	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Penicillium oxalicum	Leaves of *Avicennia marina*	India	Nayak and Anandhu 2017
Peniophorella rude	On *Hibiscus tiliaceus*	Hawaii	Gilbertson and Adaskaveg 1993
Pestaliopsis sp.	On *Pongamia pinnata*	Philippines, India, Hong Kong	Alias et al. 1999, Suryanarayanan et al. 1998
Pestalotiopsis agallochae	Endophyte of *Excoecaria agallocha, Rhizophora apiculata, Rhizophora mucronata, phragmities autralis*	India	Poonyth et al. 2000
Pestalotiopsis microspora	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Pestalotiopsis rhizophorae	leaf spots of *Rhizophora apiculata*	Thailand	Norphanphoun et al. 2019

Pestalotiopsis thailandica	leaf spots of *Rhizophora apiculata*	Thailand	Norphanphoun et al. 2019
Petriella sordida	Roots of *Avicennia officinalis*	India	Ananda and Sridhar 2002
Phaeophleospora eucalypticola	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phaeosphaeria phoenicicola	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phanerina mellea	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phellinus gilvus			Kohlmeyer 1969
Phellinus gilvus	Dead wood of *Calophyllum inophyllum*	Philippines	Murrill 1908
Phellinus terminaliae	On *Terminalia catappa*	Japan	Ito and Imai 1940
Phoma herbarum	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Phoma rhizophorae	Dead branch of *Rhizophora mangle*	West Africa	Tassi 1899
Phoma sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phomopsis asparagi	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phomopsis longicolla	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phomopsis phaseoli	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phomopsis pittospori	Roots of *Avicennia officinalis, Rhizophora mucronata*	India	Ananda and Sridhar 2002
Phomopsis rhizophorae		Brazil	Batista et al. 1955
Phomopsis sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Phomopsis terminaliae	Leaves of *Terminalia catappa*	Taiwan, Brazil, and Zambia	Hennings 1908, Sawada 1959
Phomopsis thespesiae	Leaves of *Thespesia populnea, Caesalpinia bonduc*	India	Padmabai Luke and Narayana 1979
Phragmodothis hibisci	Leaves of *Hibiscus tiliaceus*	Taiwan	Sawada 1959
Phragmostilbe linderi	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Phyllachora minuta	On *Hibiscus tiliaceus*	-	Hennings 1902
Phyllachora minuta	Leaves of *Hibiscus tiliaceus*	Indonesia	Raciborski 1900
Phyllachora yapensis	Leaves of *Pongamia pinnata*	Sri Lanka	Berkeley and Broome 1871
Phyllachora yapensis	Living leaves of *Derris sp.*	Hong Kong	Ho and Hyde
Phyllosticta bonduc	Leaves of *Caesalpinia bonduc*	Puerto Rico	Stevens 1920
Phyllosticta catappae	Leaves of *Terminalia catappa*	Burma	Sydow 1916
Phyllosticta hiratsukae	Leaves of *Rhizophora stylosa*	Japan	Kobayashi and Onuki 1990
Phyllosticta latispora	Leaves of *Terminalia catappa*	South Africa	Poonyth et al. 2000
Physalospora		Brazil	Batista et al. 1955

rhizophorae			
Podosporium consors	Languid of *Bruguiero hoinesii*	Singapore	Saccardo 1918
Polyrhizon terminaliae	Dead aerial leaves of *Thespesia populnea*, Leaves of *Termincilia*	India	Poonyth et al. 2000
Polystigma sonneratiae	Leaves of *Sonneratia caseolaris*	Philippines	Sydow and Petrak 1931
Psathyrella rhizophorae	Dead young *Rhizophora mangle* plant	Hawaii	Singer 1973
Pseudocamarosporium propinquum	Leaves of *Arthrocnemum indicum, Suaeda maritima*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al 1998
Pseudocercospora abelmoschi	Leaves of *Hibiscus tiliaceus*	USA	Tracy and Earle 1895
Pseudocercospora allophylorum	On *Allophyllus cobbe*	India	Kar and Mandal 1973
Pseudocercospora allophylorum	Dead aerial leaves of *Terminalia catappa*	India	Poonyth et al. 2000
Pseudocercospora bonducellae	Leaves of *Caesalpinia bonduc*	Brazil	Hennings 1904
Pseudocercospora caesalpiniicola	Dead aerial leaves of *Caesalpinia bonduc*	India	Poonyth et al. 2000
Pseudocercospora catappae	Leaves of *Terminalia catappa*	Zanzibar	Hennings 1903
Pseudocercospora catappae	Leaves of *Terminalia catappa*	Taiwan	Goh and Hsieh 1990
Pseudocercospora hibiscina	Leaves of *Hibiscus tiliaceus*	Mexico	Ellis and Everhart 1895
Pseudocercospora mapelanensis	Leaf spots of *Avicennia marina*	South Africa	Osorio et al. 2017
Pseudocercospora nymphaeacea	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Pseudocercospora pongamiae-pinnatae	Living leaves of *Pongamia pinnata*, On *Allophyllus cobbe*	India	Poonyth et al. 2000
Pseudocercospora rhizophoricola	Leaves of *Rhizophora racemosa*	Sierra Leone	Deighton 1976
Pseudocercospora sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*, *Excoecaria agallocha*	Taiwan, Hong Kong	Ho and Hyde (Unpublished), Wei-Chiung Chi et al. 2019
Pseudoeurotium zonatum	Roots of *Rhizophora mucronata*	India	Ananda and Sridhar 2002
Pseudopestalotiopsis avicenniae	Leaf spots of *Avicennia marina*	Thailand	Norphanphoun et al. 2019
Pseudopestalotiopsis curvatispora	Leaf spots *of Rhizophora mucronata*	Thailand	Norphanphoun et al. 2019
Pseudopestalotiopsis rhizophorae	Leaf spots of *Rhizophora apiculata*	Thailand	Norphanphoun et al. 2019
Pseudopestalotiopsis thailandica	leaf spots of *Rhizophora mucronata*	Thailand	Norphanphoun et al. 2019
Pterosporidium	Living leaves of *Rhizophora mangle*	Bermuda	Ho and Hyde 1996

rhizomorphae			
Pyrenophora dematioidea	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Pyrrhoderma noxium	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Ramichloridium punctatum	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Ramularia catappae	Leaves of *Terminalia catappa*	Indonesia	Raciborski 1900
Ravenelia stictica	Leaves of *Pongamia pinnata*	Sri Lanka	Berkeley and Broome 1871
Rhabdospora phoenicis	Dry branch of *Phoenix reclinata*	Portugal	Poonyth et al. 2000
Rhizoctionia solani	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Rhizopus stolonifer	Leaves of *Rhizophora mucronata*	Pakistan	Tariq et al. 2006
Rhytidhysteron kirshnacephalus	Dead branches of standing *Rhizophora apiculata*	Thailand	This study
Rhytidhysteron mangrovei	Dead branches of standing *Rhizophora apiculata*	Thailand	Kumar et al. 2019b
Sammeyersia grandispora	Roots of *Rhizophora mucronata* and *Sonneratia caseolans*	India	Ananda and Sridhar 2002
Savoryella nypae	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Schizothyrium laguncularіae	Leaves of *Laguricularia racemosa*	Brazil	Poonyth et al. 2000
Scolecostigmina palmivora	Leaves of *Phoenix reclinata*	-	Poonyth et al. 2000
Scolecotrichum barringtoniae	Leaves of *Barringtonia racemosa*	Madagascar	Viennot-Bourgin 1963
Sebacina minima	Rotting wood of *Hibiscus tiliaceus*	Tahiti	Olive 1958
Septoria thespesiae	Living leaves of *Pongamia pinnata*	India	Poonyth et al. 2000
Septoriella hubertusii	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Setoseptoria arundinacea	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Skierka agallochae	Leaves of *Excoecaria agallocha*	Indonesia	Raciborski 1909
Sphaeronaema avicenniae	Leaves of *Avicennia germinans*	Dominican Republic	Gonzalez Fragoso and Ciferri 1926
Sphaerostilbe dubia	Bark of *Aegiceras corniculatum*	Australia	Berkeley 1881
Sporormiella minima	On *Thespesia populnea*, Leaves of *Rhizophora apiculata, Acanthus ihcifolius, Avicennia marina, Avicennia officinalis, Bruguiera cylindrica, Ceriops decandra, Excoecana agallocha, Lummtzera racemosa, Rhizophora apiculata, Rhizophora mucronata, Sonneratia caseolans, Sesuvium portulacastrum*	India	Kumaresan and Suryanarayanan 2001, Kumaresan and Suryanarayan 2002, Suryanarayanan and Kumaresan 2000, Suryanaryanan et al. 1998
Stagonosporopsis cucurbitacearum	Leaves of *Acanthus ilicifolius* var. *xiamenensis*		Wei-Chiung Chi et al. 2019
Striatiguttula phoenicis	Rachits of *Nypa fruticans*	Thailand	This study

Stypella grilletii	Leaves of *Hibiscus tiliaceus*	Tahiti	Olive 1958
Syncephalastrum racemosum	Endophyte and living leaves	India, Malaysia	Kuthubutheen 1984, Rai 1969
Tinctoporellus epimiltinus	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Trametes demoulinii	Dead wood of *Terminalia catappa*	Papua New Guinea	Castillo 1994
Trametes rhizophorae	Living leaves of *Rhizophora mangle*, Trunk of *Rhizophora sp.*	Papua New Guinea	Reichardt 1870, Ho and Hyde 1996
Trichocladium sp.	Fronds of *Nypa fruticans*	Brunei	Hyde and Sarma 2006
Trichoderma viride	Living leaves of mangrove leaves	Hawaii, Mexico, Malaysia, Florida (USA), India	Bremer 1995, Poonyth et al. 2000, Kuthubutheen 1984, Lee et al. Lee1973, Newell 1976, Rai et al. 1969, Tariq et al. 2006
Tryblidaria pongamiae	Living roots, seedlings and living leaves of *Avicennia germinans, Rhizophora mangle, Sonneratia alba, Rhizophora mangle*	India	Poonyth et al. 2000, Rao 1966
Tulasnella bifrons	On *Hibiscus tiliaceus*	-	Bourdot and Galzin 1923
Tulasnella pacifica	Dead wood of *Hibiscus tiliaceus*	Tahiti	Olive 1957
Tulasnella violea	On *Hibiscus tiliaceus*	-	Bourdot and Galzin 1909
Urohendersonia pongamiae	Aerial dead wood of *Pongamia pinnata*	India	Poonyth et al. 2000
Verticillium calophylli	On *Calophyllum inophyllum*	Mauritius	Wiehe 1949
Xylaria sp.	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Zalerion maritima	Roots of *Acanthus ihcifolius, Rhizophora mucronata*	India	Ananda and Sridhar 2002
Zasmidium citri	Leaves of *Acanthus ilicifolius* var. *xiamenensis*	Taiwan	Wei-Chiung Chi et al. 2019
Zygosporium masonii	Roots of *Acanthus ihcifolius, Avicennia officinalis, Rhizophora mucronata*	India	Ananda and Sridhar 2002

Figures

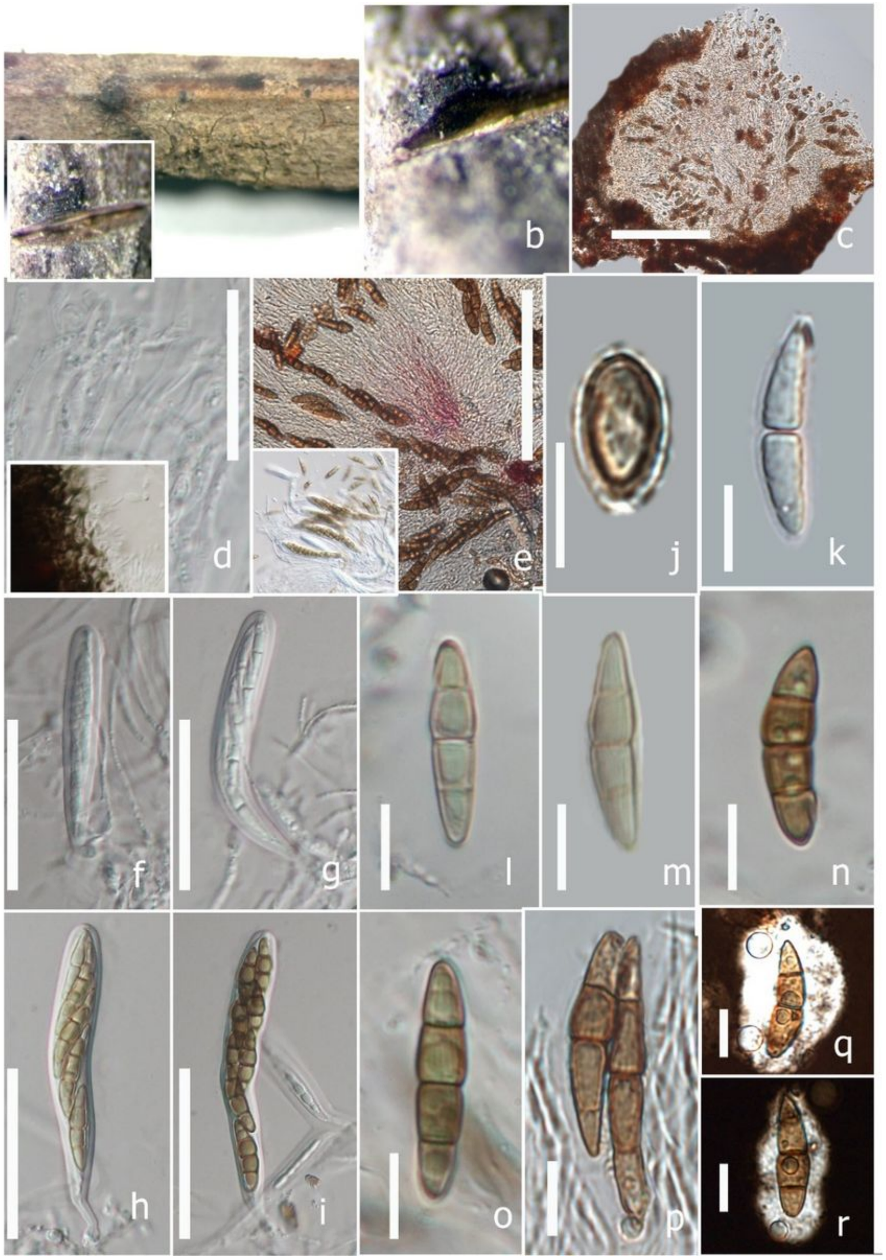

Figure 1

Striatiguttula phoenicis (Sexual morph; MFLU 19-2847). a, b Appearance of ascoma on the host surface. c Section of ascoma. d Peridium, e Hamathecium. f–i Asci. j–p Ascospores. q, r Ascospore mucilaginous sheath in Indian ink. Scale bars: c = 100 μm, d,e = 200 μm, f–i = 50 μm, j–r = 10 μm.

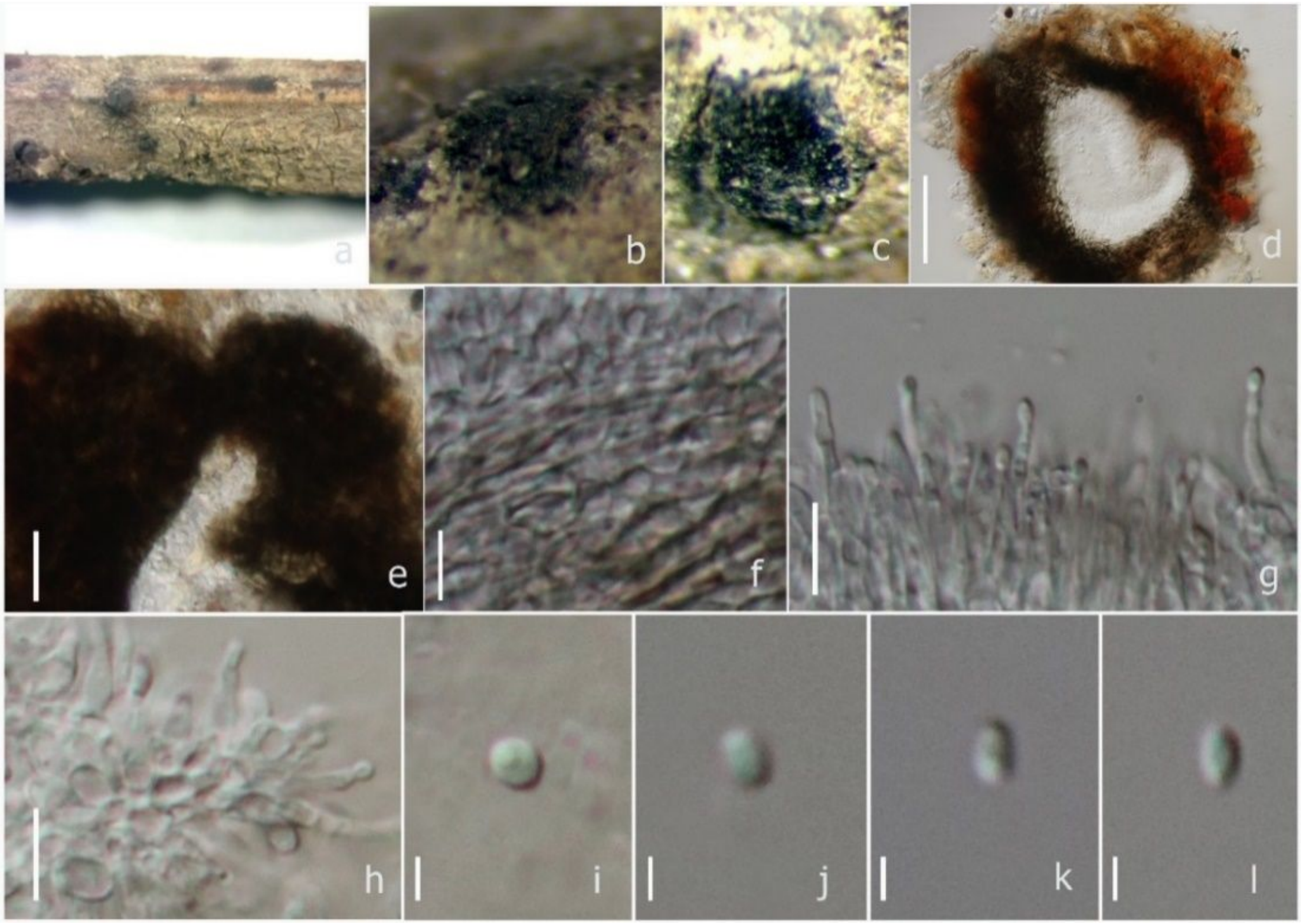

Figure 2

Striatiguttula phoenicis (asexual morph, MFLU 19-2847). a–c Appearance of conidiomata on the host surface. d Vertical section of conidioma. e Apex of conidioma. f Conidiomatal wall. g, h Conidiogenous cells and developing conidia. i–l Conidia. Scale bars d = 100μm; e, f = 50μm; g,h = 20 μm; i–l = 5μm

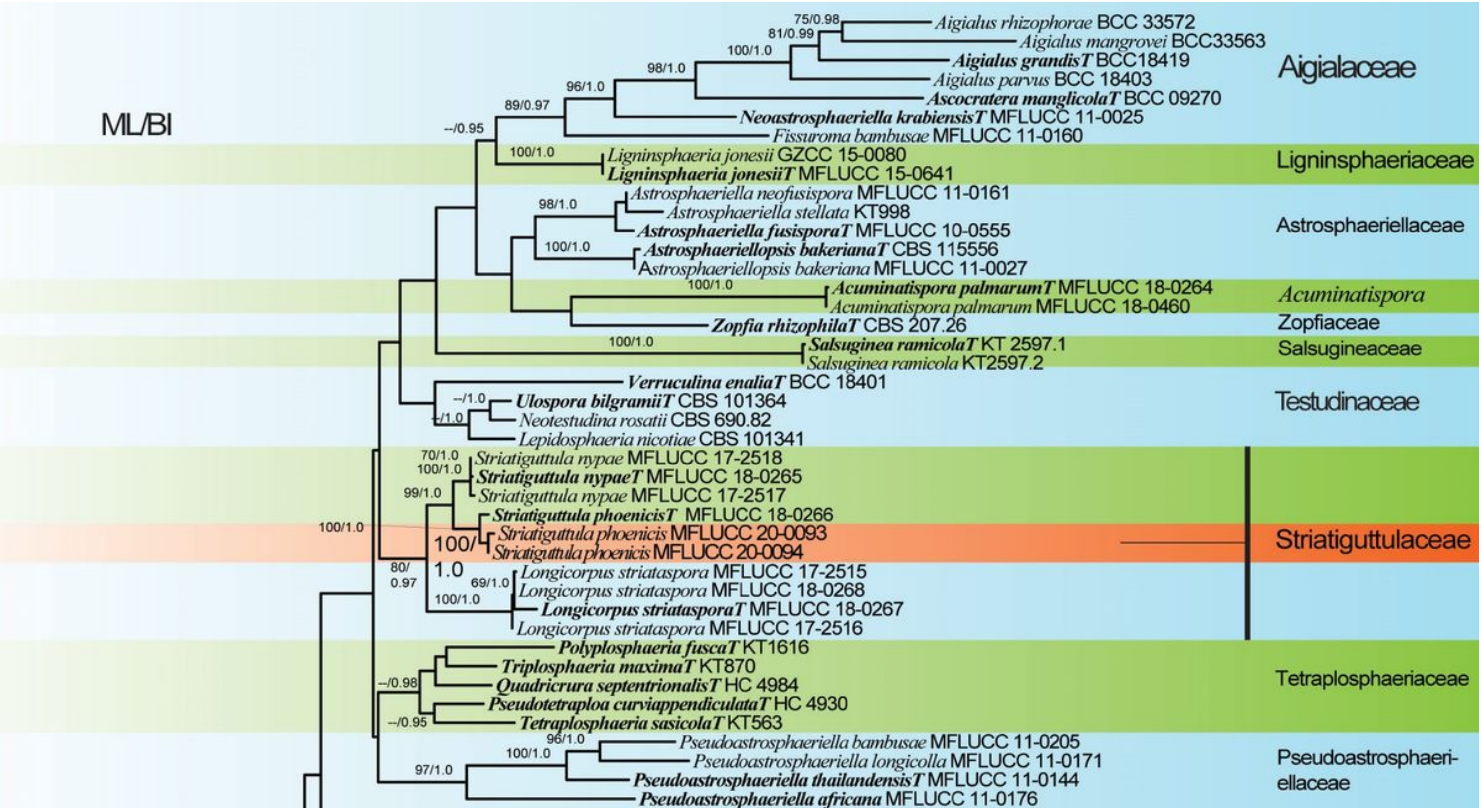

Figure 3

RAxML tree of Pleosporales based on analysis of combined LSU, SSU, and TEF1α sequence data inferred from 110 taxa and 2764 sites. The tree is artificially rooted to Arthonia dispersa (UPSC2583), Dendrographa decolorans (Ertz 5003 (BR), Lecanactis abietina (Ertz 5068 (BR), and Roccella fuciformis (Tehler 8171). Bootstrap values for ML equal to or greater than 60% and Bayesian inference equal to or greater than 0.90 are placed above and below the branches,

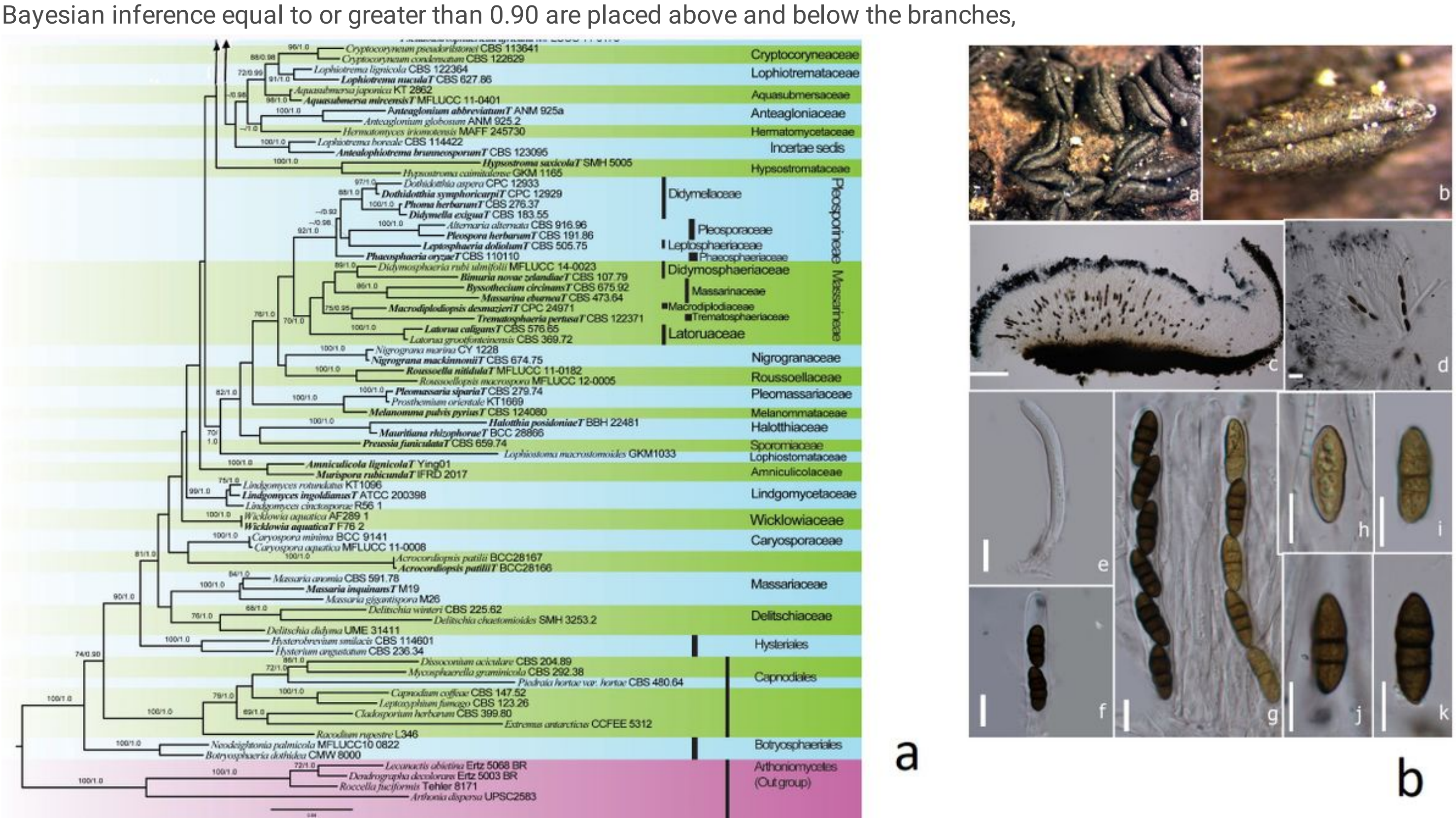

Figure 4

Rhytidhysteron kirshnacephalus (holotype MFLU 20-0427). a Appearance of apothecioid ascomataon the host substrate. b Close up of ascomata. c Section of ascoma. d hymenium mounted on water. e–g Asci. h–k Ascospores (h: note the ascospore with guttules). Scale bars d = 100 μm; e–i = 20 μm; j–p = 10 μm

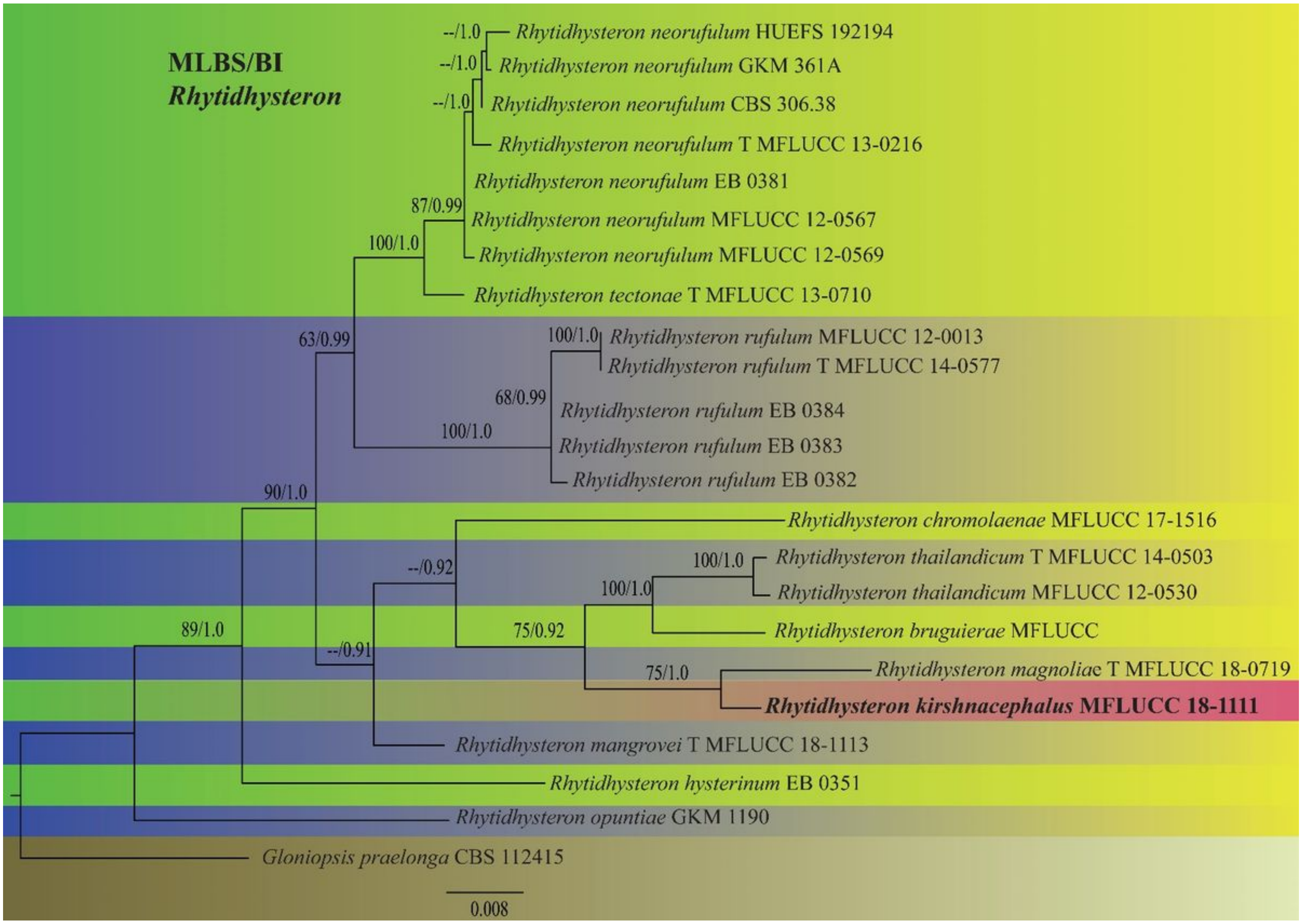

Figure 5

Maximum likelihood tree inferred from a combined SSU, LSU, ITS and TEF sequence dataset including 22 taxa from Rhytidhysteron. The tree is rooted to Gloniopsis praelonga (CBS 112415). Maximum likelihood bootstrap values (MLBS) ≥60 % are defined as MLBS above or below the branches and Bayesian inference equal to or greater than 0.90 are placed above the branches, respectively. The new species is in black bold font

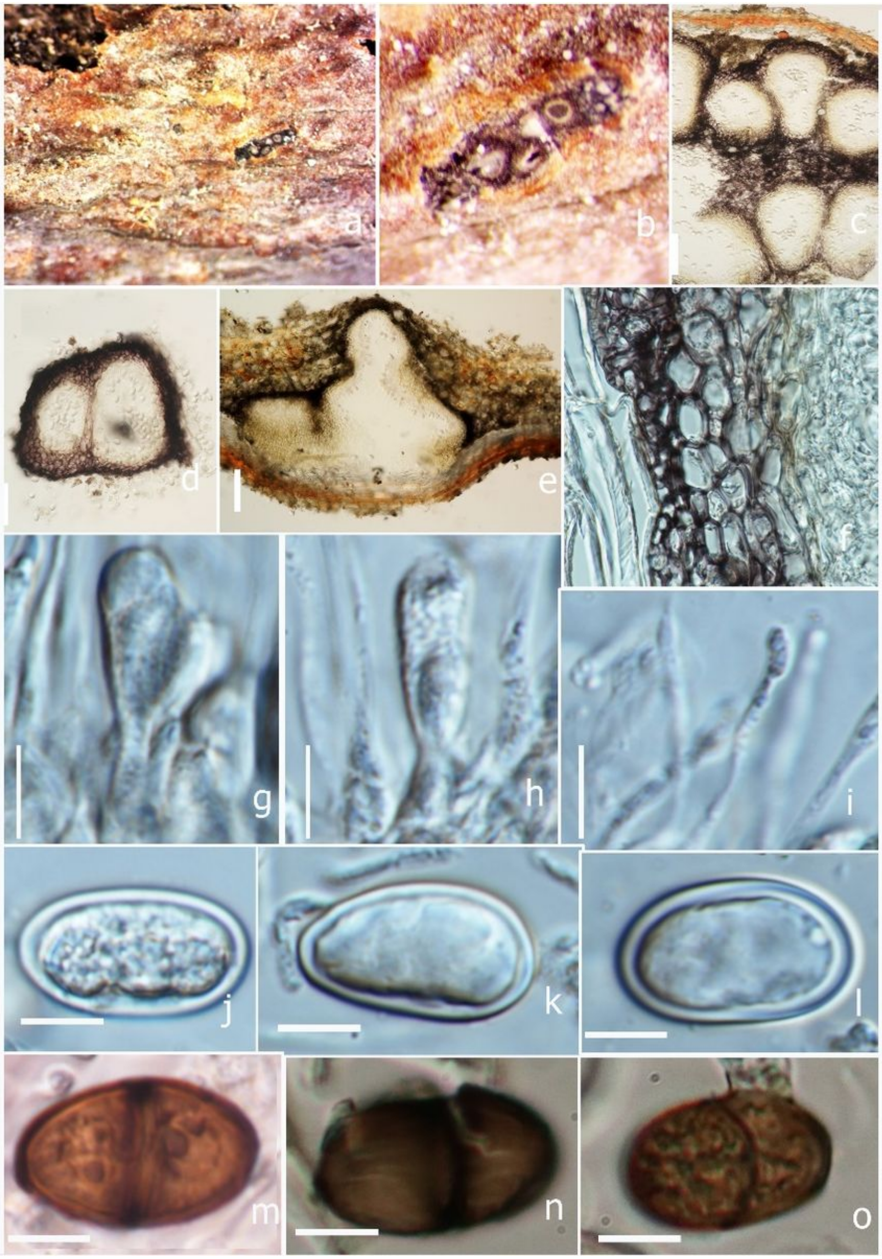

Figure 6

Lasiodiplodia citricola (MFLU 19-0622). a, b Appearance of conidiomata on host substrate. c–e Section of conidiomata. f. Conidiomatal wall. g, h Conidiogenous cells. i Paraphyses. j–l Immature conidia. m–o Mature conidia. Scale bars: c–e = 100 μm; g–o = 10 μm

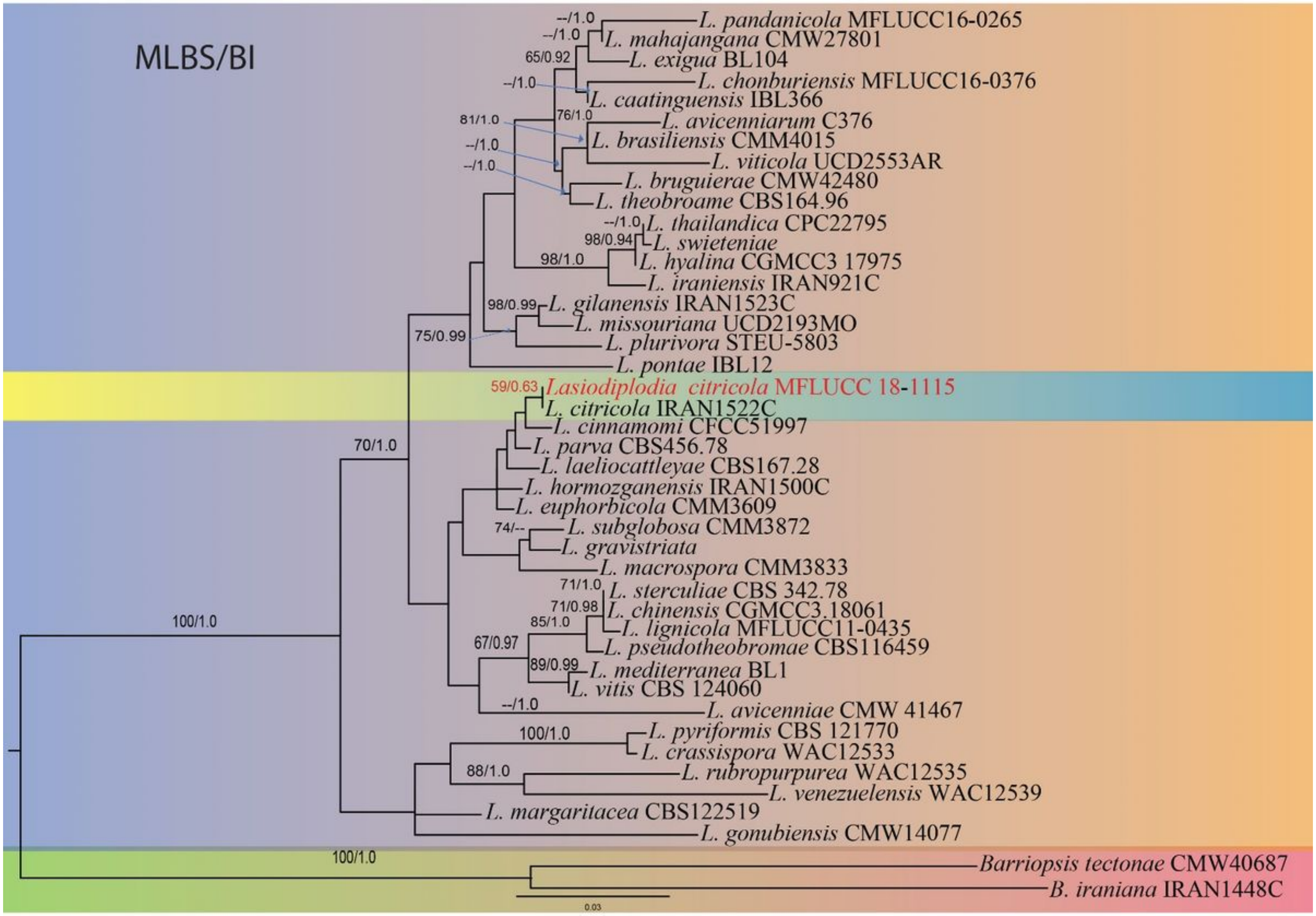

Figure 7

Maximum likelihood (ML) phylogram analysis inferred from 41 strains and a combined ITS and TEF1-α sequence data. The tree is artificially rooted to Barriopsis iraniana (IRAN1448C) and B. tectonae (CMW40687). Bootstrap values for ML equal to or greater than 65 and Bayesian posterior probabilities (BYPP) equal or greater than 0.90 are provided at the branches in that order. The new isolate is in red font